ELECTRICAL TIMES

THURSDAY
26 JUNE
1952
NINEPENCE

THE SIMPLEST AND CHEAPEST

way of terminating paper insulated cables in industrial and domestic installations is with BICC Moulded Terminal Boxes.

They comprise two similar halves held together by the fixing screws and are made entirely from moulded insulating material. Convenient knockouts provided for up to 5 single-core insulated tails. May be installed horizontally or vertically.

Further information available on request.

BICC *Moulded Terminal Boxes are made in two sizes as follows:—*

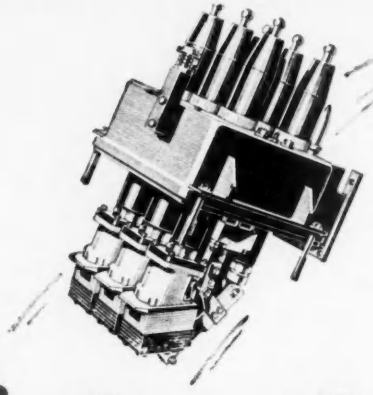
*List No. A.*11424 ($4\frac{1}{2}$ *in. high*)*—single-core up to .06 sq. in.; multi-core up to .0225 sq. in.*

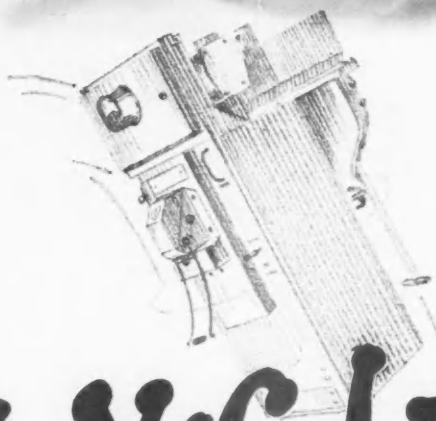
*List No. A.*11425 ($5\frac{7}{8}$ *in. high*)*—single-core up to .25 sq. in.; multi-core up to .10 sq. in.*

B.I. Callender's

MOULDED TERMINAL BOXES

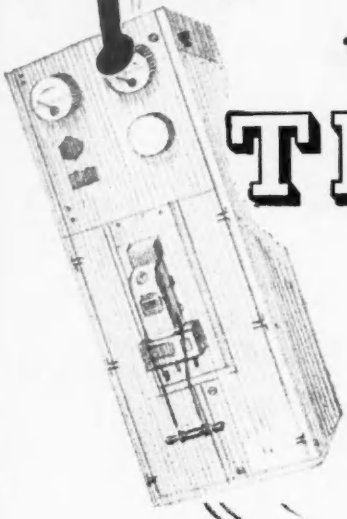
BRITISH INSULATED CALLENDER'S CABLES LIMITED
NORFOLK HOUSE, NORFOLK STREET LONDON, W.C.2

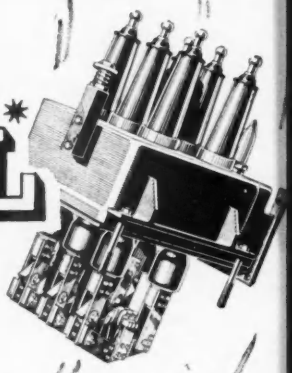


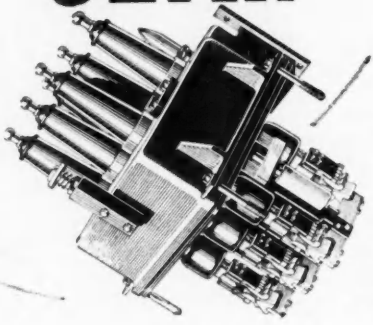


YOU CAN JUGGLE

WITH J. & P. TRINAL GEAR







★ *The "three-fold" range that can save you pounds and pounds through interchangeability. Details in Publication SG. 86.*

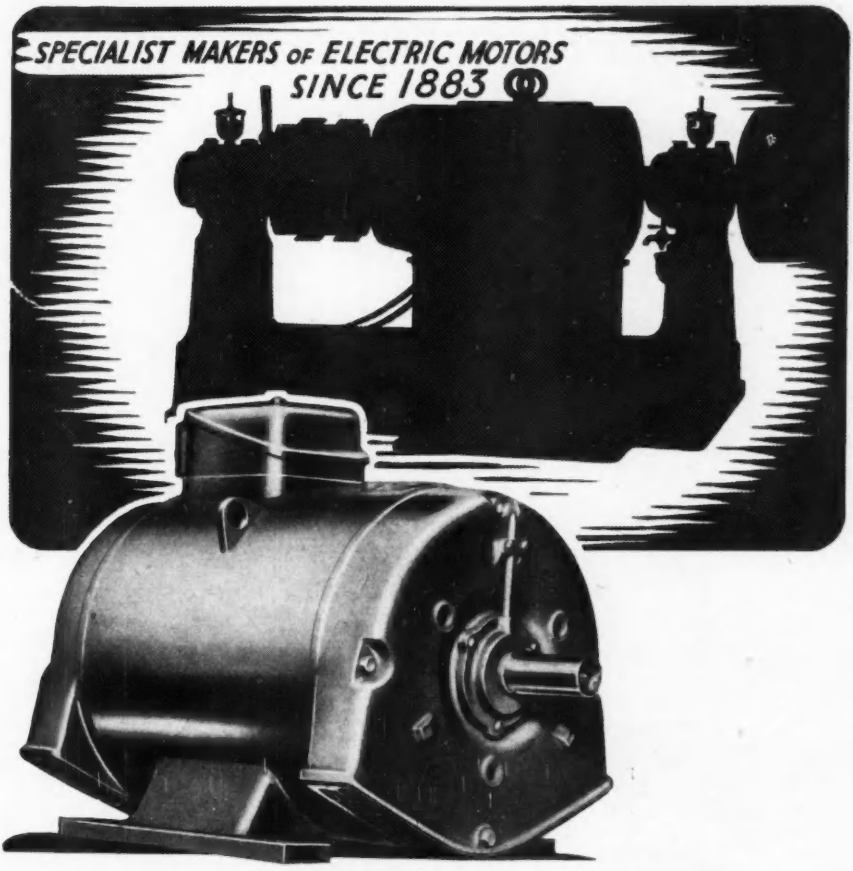
Engineers will appreciate the advantage of being able to install a switchboard rated, for instance, at 150 MVA at 11 kV or 6.6 kV with the provision that at a later date it could be up rated to 250 MVA by the substitution of higher rated breakers.

The interchangeability of the Trinal Range permits such a conversion on site, and the initial reduction in capital expenditure is not achieved at the risk of possible future redundancy as the displaced breakers can be incorporated in other boards. The breakers are A.S.T.A. certified, and the oil switch is tested to B.S.116, 1937.

JOHNSON & PHILLIPS LTD.

CHARLTON · LONDON · S.E.7

ELECTRICAL ENGINEERS & CABLE MAKERS



BEST OF BOTH WORLDS

If it is old-fashioned to be able to call on wide experience and to take a pride in the job, then L.S.E. are old-fashioned. But they make very efficient motors* in well-equipped factories, and a number of their designs are (what's the expression?) way out in front.

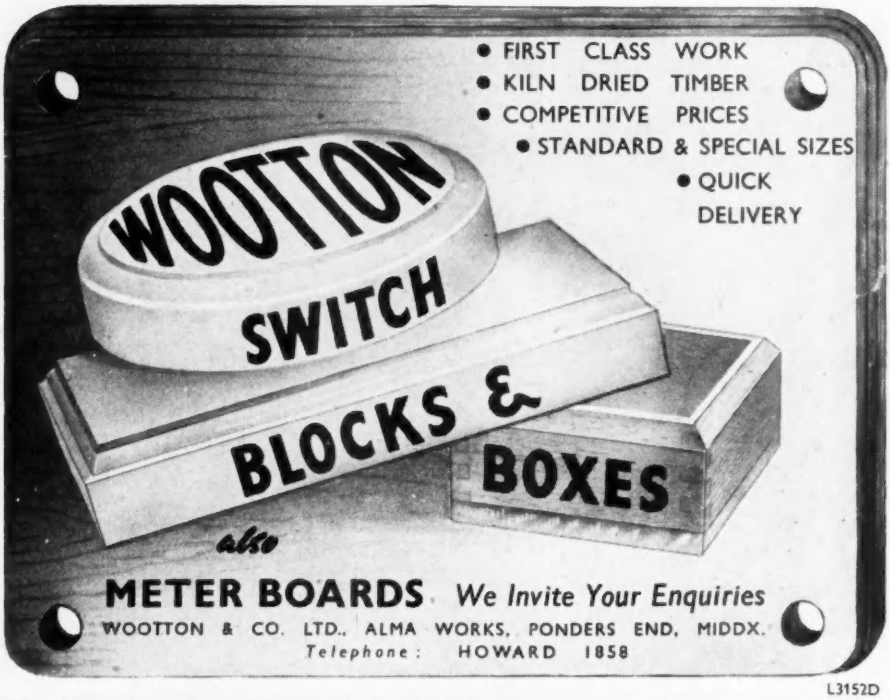
*Not forgetting control gear.

LSE

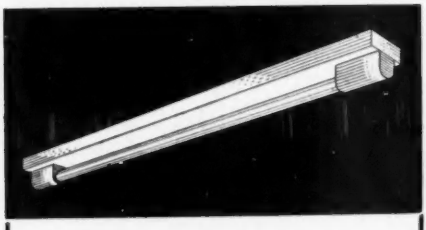
NORWICH & MANCHESTER

LAURENCE, SCOTT & ELECTROMOTORS LIMITED

A



L3152D



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Retail Price £4/17/6 (Tube extra)

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"SANFORD" fittings are becoming increasingly popular because:

1. *PRICE IS REASONABLE*
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THE STEEL COVERED HEATER UNIT

IN its variety of forms, the Cressall steel jacketed unit heater is the solution to most heating problems. Let a Cressall Technical Expert discuss heating with you before you decide. He will be happy to help.

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Registered Trade Name of
THE CRESSALL MANUFACTURING CO. LTD
Tower Street, Birmingham 19
Telephone: ASTon Cross 2666 (3 lines)
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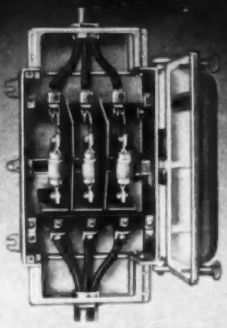
You cannot buy better gear



IMPERIAL FUSE SWITCHES.

46 M.V.A. SHORT CIRCUIT "MAKING" TESTS

PREVIOUSLY TESTED AT 33 M.V.A. NOW SUCCESSFULLY TESTED AT 46 M.V.A. 440 VOLTS.

SIZES OF 30, 60, 100, 160, 200, 300 AND 500 AMPERES WERE TESTED AND ALL SWITCHES WERE FIT FOR NORMAL USE AFTER TESTS.

"ENGLISH ELECTRIC" CARTRIDGE FUSE LINKS WERE USED IN THESE FUSE SWITCHES.

FOR DETAILS OF IMPERIAL FUSE SWITCHES SEE PUBLICATION G551.

BILL SWITCHGEAR LTD.
ASTON LANE · PERRY BARR
BIRMINGHAM · 20

LONDON A.W.ZELLEY & W.N.PAYNE
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SOUTH W.L.WHITE.
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a complete cooker for £6 · 19 · 6!

Here is something you really *can* sell! A complete cooker which does *all* the cooking for one, two, three or even more people. Just the thing for anyone who does not need a full size cooker — for small homes, "bed sitters", caravans and so on — or an auxiliary for larger cookers of any kind. It works off any power point and is the most economical complete cooker ever produced. Any sort of utensil can be used on the open radiant type grill-boiler. It roasts, bakes, boils, fries, grills, toasts — in fact everything that a big cooker does. Overall size 11½"d. x 13¾"w. x 11¾"h. Weighs only 25 lb. Oven 600 watts, grill boiler 1750 watts. Finished, cream and black vitreous enamel. Write for illustrated leaflet.

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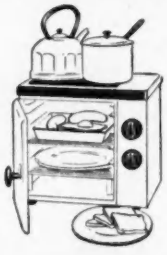	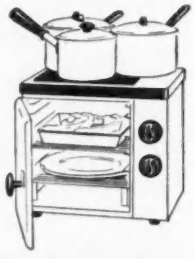	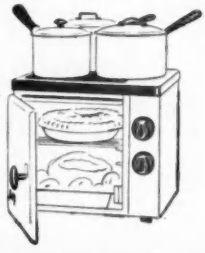

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CRC 389

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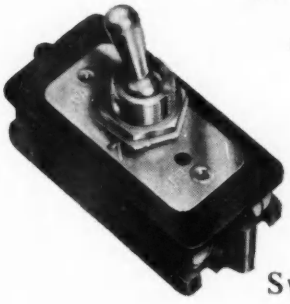
... and de Havilland, who specified N.S.F. Cutler-Hammer Switches for service in the world's first jet airliners now in regular operation between London and Johannesburg.



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Switch to N.S.F. for **better switching**

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A.C. or D.C.—INDUCTION OR COMMUTATOR MOTORS

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MADE IN ENGLAND
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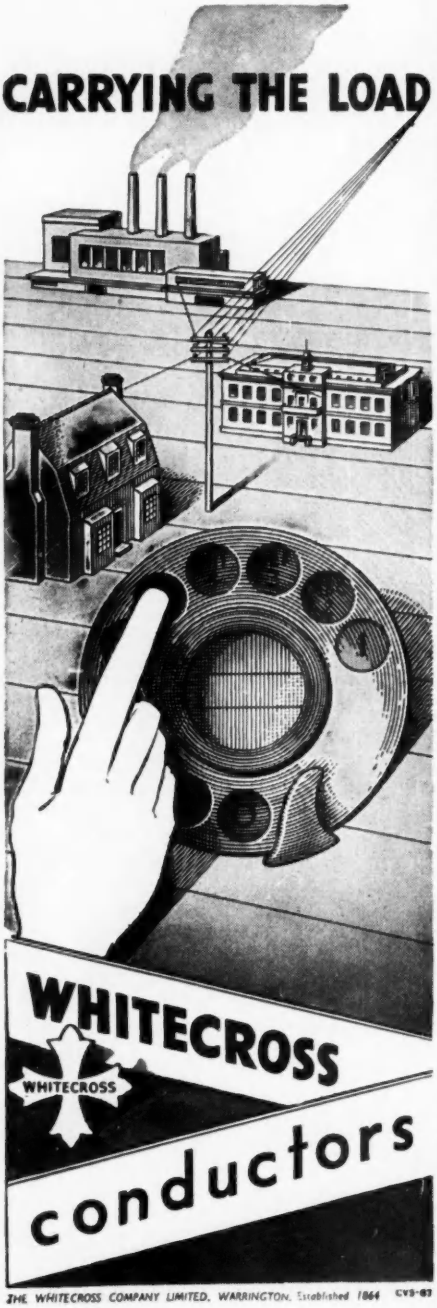
BRITISH STANDARD

Advertisement of the
ASSOCIATION OF STEEL CONDUIT MANUFACTURERS
21, WATERLOO ST · BIRMINGHAM



THE WHITECROSS COMPANY LIMITED, WARRINGTON. Established 1864 CVS-83

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FLANGES

FOR FIXING

Electric Immersion Water Heaters, Gas Heated Water Circulators

to closed tanks and cylinders. Removal of manlids unnecessary. No soldering.

Pure mechanical fitting into one round hole.

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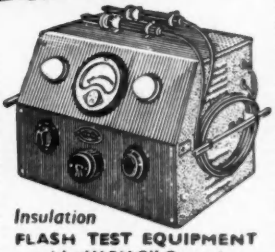
Tel: Royal 3481-2 Grams: "Epabos" Liverpool

Flash Testing up-to-date



Insulation

FLASH TEST EQUIPMENT

with "VARIAC" Control

Booklet on request

It's a ZENITH *product!*

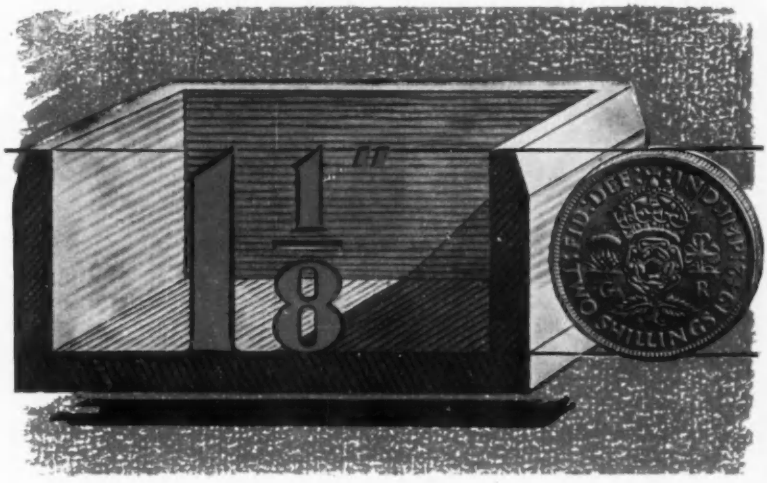
The ZENITH ELECTRIC Co. Ltd.

Sole makers of the well-known "Zenith" Electrical Products

Zenith Works, Villiers Road, Willesden Green, London, N.W.2

Phone: Willesden 4087. *Grams:* Voltaohm, Norphone, London

CHECK THAT BOX BEFORE ERECTION



ONLY ONE SIZE OF BOX IS NEEDED FOR ALL CRABTREE 5 AMP. FLUSH ACCESSORIES

IT is no longer necessary to stock a 1" box for some Crabtree switches and a 1⅛" box for others. Only *one* size of shallow box is now needed for *all* Crabtree 5 amp. "Standard" flush switches and wiring accessories. This has an internal depth of 1⅛".

To avoid confusion, the box should be checked before erection. As a rough-and-ready guide, the inside walls of the box should be as deep as a two-shilling piece standing on its edge.

CRABTREE

A name synonymous with Progress in Accessories and Switchgear

"Crabtree" (Registered) *C.654/130 Advt. of J. A. Crabtree & Co. Ltd., Walsall, Staffs, England*

DFM

TYPE TM2

Available with pointer or cyclometer type dial

QUALITY

DELIVERY

DENIS FERRANTI METERS LTD.

(formerly British Electric Meters Ltd.)

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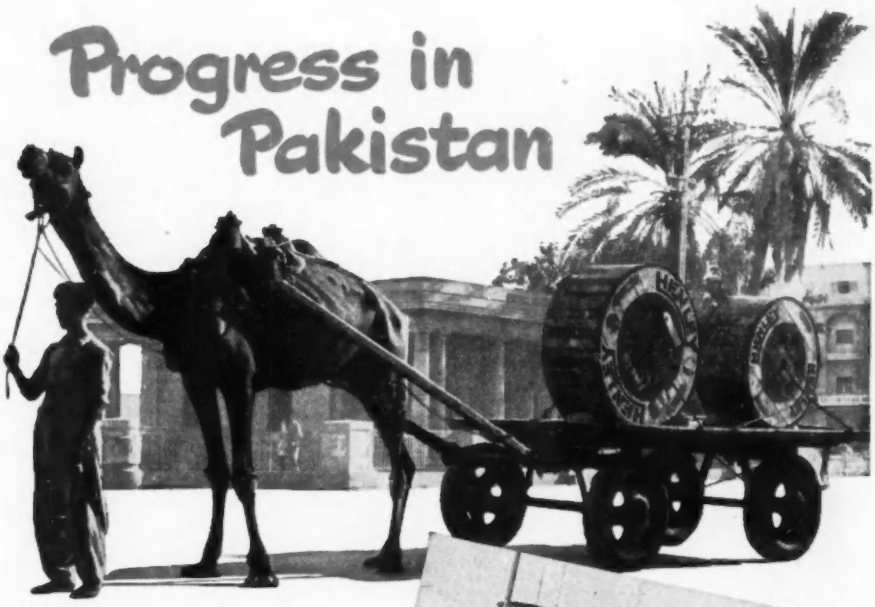
Denis Ferranti Group

Progress in Pakistan



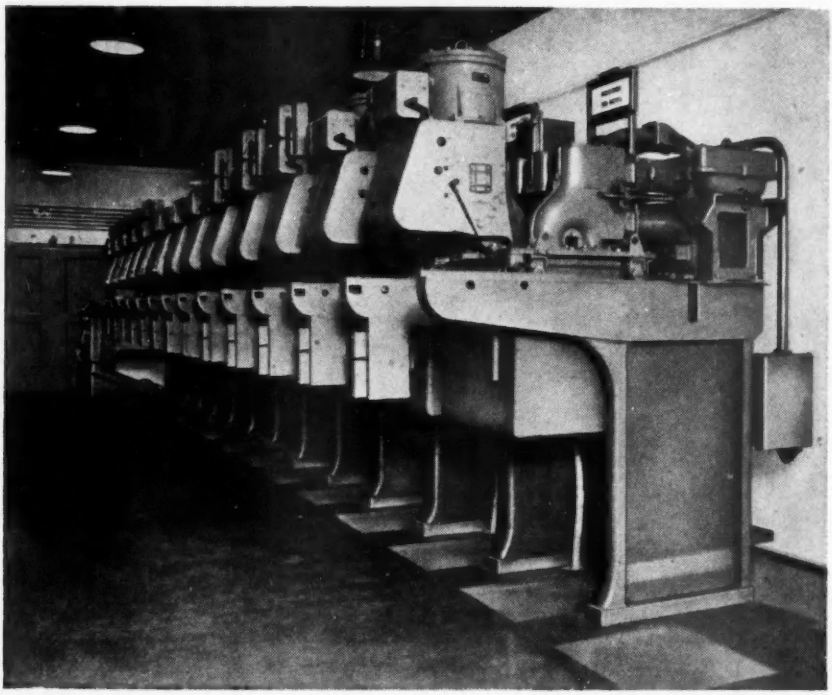
The upper picture shows progress by time honoured methods. The cables however will eventually carry the current to up-to-date new quarters for Pakistan Government employees. The lower picture represents more modern means of transport. It shows the entrance to Karachi Airport, where Henley Mains Cables are being laid.

BY APPOINTMENT
ELECTRIC CABLE
MANUFACTURERS

Let HENLEY CABLES *carry the current*

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 HATTON GARDEN, LONDON, E.C.1

★ *If you want to talk switchgear . . . . talk to Reyrolle*



Consulting Engineers, Messrs. McLellan and Partners

METALCLAD SWITCHGEAR AT ABBEY STEEL WORKS

Reyrolle Metalclad horizontal draw-out switchgear was selected for the main control of supplies within the Abbey Steel Works, Port Talbot, South Wales. The 11 kV switchboards are of various ratings, these being type B5T with oil-break circuit-breakers of 500 MVA breaking capacity and types B3T and B2T switchgear of 350 MVA and 250 MVA breaking capacity respectively.

If you want to talk switchgear

A. Reyrolle & Company Ltd., Hebburn, Co. Durham. ***• • • talk to Reyrolle***

CRC 198

Catalogue No. P.3712

BRITMAC

ILLUSTRATIONS:

"Industrial" Ironclad switch and socket assembly and switch plug unit. Catalogue Number P.3712. Available for vertical or horizontal mounting.
Catalogue Number P.1402 arranged for horizontal mounting only.
Both types are obtainable in 2, 5 and 15 amp. sizes.

the points in favour . . .

QUALITY:

Throughout the whole range of BRITMAC Electrical Accessories—the testing of raw materials—the continual research into improved methods of manufacture—the rigorous inspection at all stages of production—ensure the Highest Standard of Quality and Finish.

Catalogue No. P.1402

. . . at every point — "BRITMAC"

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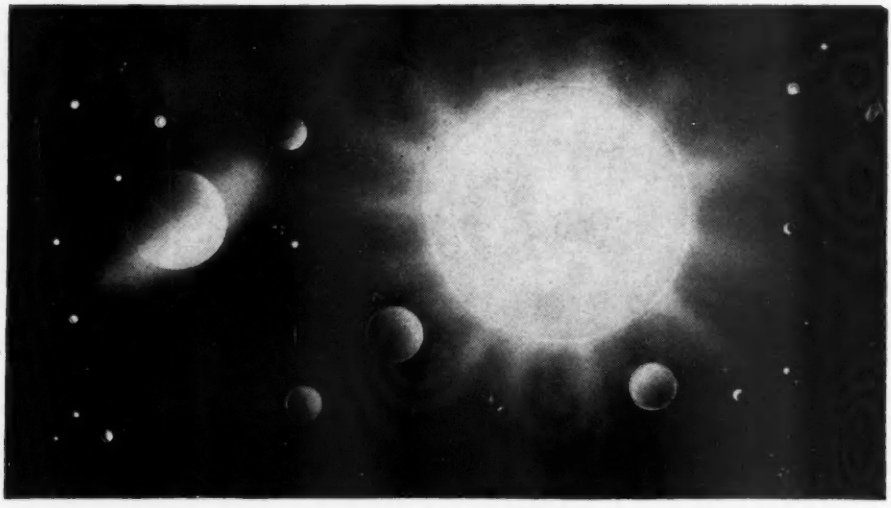

Astronomically Speaking

If our total production of all types of winding wires in the last fifty years could be tied end to end, it would stretch up to the sun—93 million miles away—and most of the way back again.
So now you have a fair idea of our total production in length—or have you?
We just mention this astronomical data en passant: the idea of running up to the face of the sun in a temperature of some 10,000°F. doesn't appeal to us in the least. Making and keeping more and more satisfied customers is our primary interest.
The largest manufacturers of fine enamelled wire in the world.

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PROOF OF SUCCESSFUL PIONEERING

the first

132 k.v GAS FILLED CABLE LAID IN GT. BRITAIN DEC·1937

has given and is still giving "most satisfactory service"....

THE FOLLOWING ARE EXTRACTS FROM A REPORT BY THE BRITISH ELECTRICITY AUTHORITY ON THE PERFORMANCE OF THIS CABLE

132 kV GLOVER GAS-FILLED CABLE INSTALLATION AT WIMBLEDON

(a) The cable was laid in the form of a loop, 1 mile in length; and was connected in series through isolators.

(b) No maintenance was carried out other than the cleaning of sealing end porcelains.

(c) No technical faults occurred on the cable.

(d) The performance of the cable was most satisfactory.

W. T. GLOVER & CO LTD.

TRAFFORD PARK MANCHESTER 17

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THE WORTHINGTON-SIMPSON

Monobloc

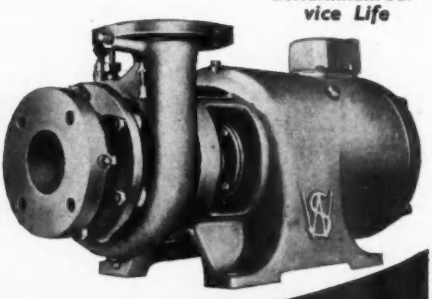
Note these Features . . .
Which mean a superior performance over a longer life

No shaft wear
Separable liquid end
Only one stuffing box
Suction pressure on stuffing box
Hydraulically balanced impeller
Accessibility
Shaft protected from liquid
Quietness in operation
Renewable wearing parts
Choice of materials of construction

. . . and all the outstanding advantages of the Monobloc construction . . .

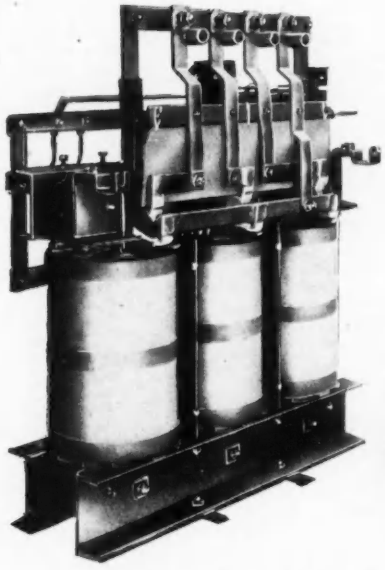
Pump and motor one unit. Compactness. Easy installation. Few parts. Base integral. Only one shaft. No danger of misalignment. Freedom from vibration. No belts, pulleys or couplings. Horizontal or vertical installation. Low initial cost. Low power consumption.

For Economical Trouble Free Operation Over a Maximum Service Life



WORTHINGTON-SIMPSON LTD NEWARK NOTTS

LINDLEY THOMPSON *Core Type* TRANSFORMERS

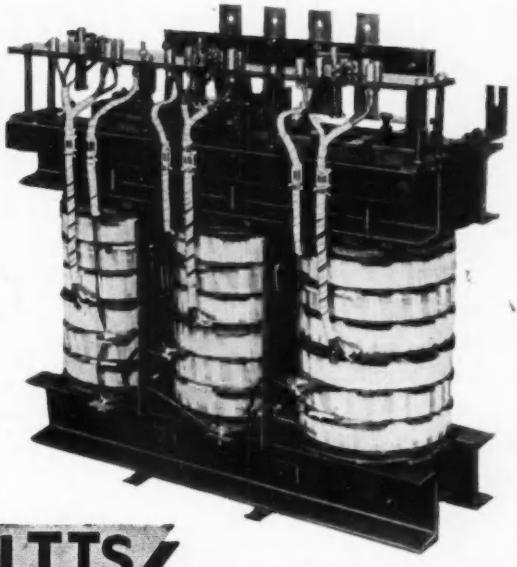


600 kVA, 3-phase, 50 cycles.
Voltage ratio 6,600-433.
With off-load tapping switch.

100 kVA, 3-phase, 50 cycles.
Voltage ratio 6,600-433.

Nothing has been overlooked in the manufacture of these Core Type Transformers. Winding, cooling, insulation, drying . . . every factor which makes for the utmost efficiency has been considered.

The functions and characteristic features of these Units are fully described in the Brochure of the LINDLEY THOMPSON TRANSFORMER & SERVICE CO. LTD. A copy will gladly be sent to any Electrical Engineer or Executive who requests it.



TWO YEARS GUARANTEE WITH ALL TRANSFORMERS

THE LINDLEY THOMPSON TRANSFORMER & SERVICE CO. LTD.

ST. MARY'S ROAD MIDDLE GREEN . SLOUGH . BUCKS

A page from the REVO Album . .

Here is an excellent photograph, typical of many in the Revo album of street lighting views, showing the splendid results obtained from an installation of Revo sodium cut-off fittings mounted on Revo concrete columns at Widnes.

(Reproduced by courtesy of the Widnes Borough Engineer and Surveyor)

REVO ELECTRIC CO. LTD.
TIPTON . . . STAFFS.

Street Lighting by

REVO
REGD.

Spotlight on Quality

ELEPHANTIDE

REGD.

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BRITISH MADE BY

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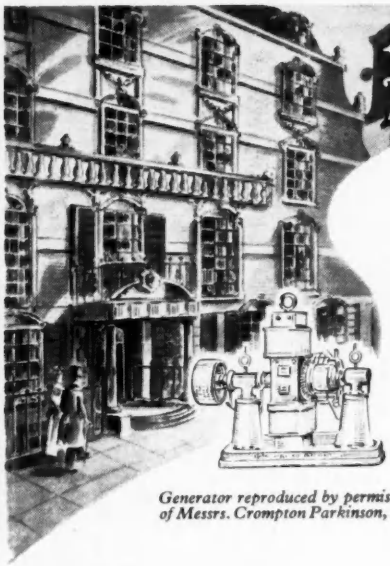

1892

In

VICTORIAN MANSION

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Modern Villa!

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1952

Tucker "Quality" switches have controlled electric lighting and power circuits for the past sixty years.

The farsighted imagination of J. H. TUCKER AND CO., LTD., ensured advances in design abreast of everchanging times and anticipating the needs of this modern community.

Architectural design has undergone no greater changes in the past sixty years than the corresponding construction and appearance of the Tucker switches and accessories which now serve the installation requirements of civic buildings, industrial premises, transport, theatres, etc., even to the crofter's cottage and the artisan's villa.

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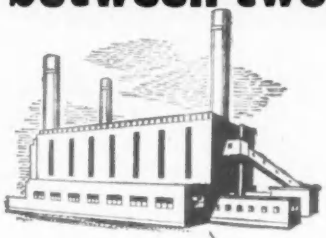

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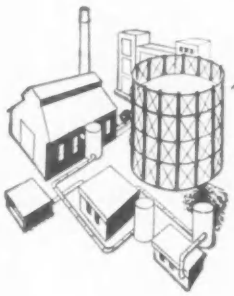

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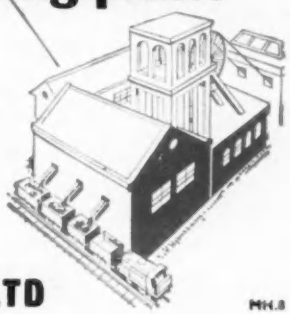

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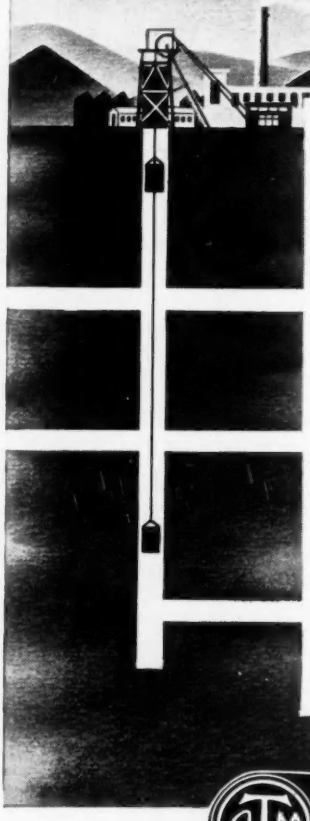

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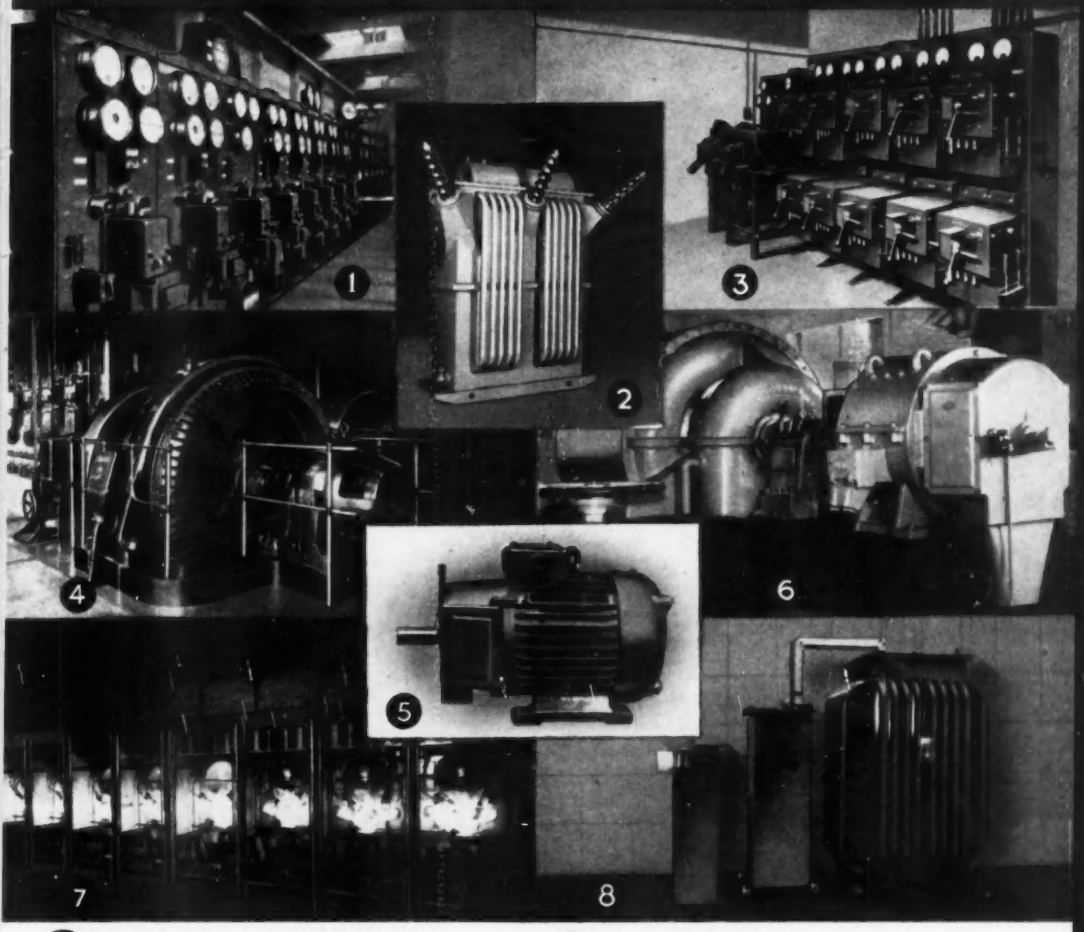

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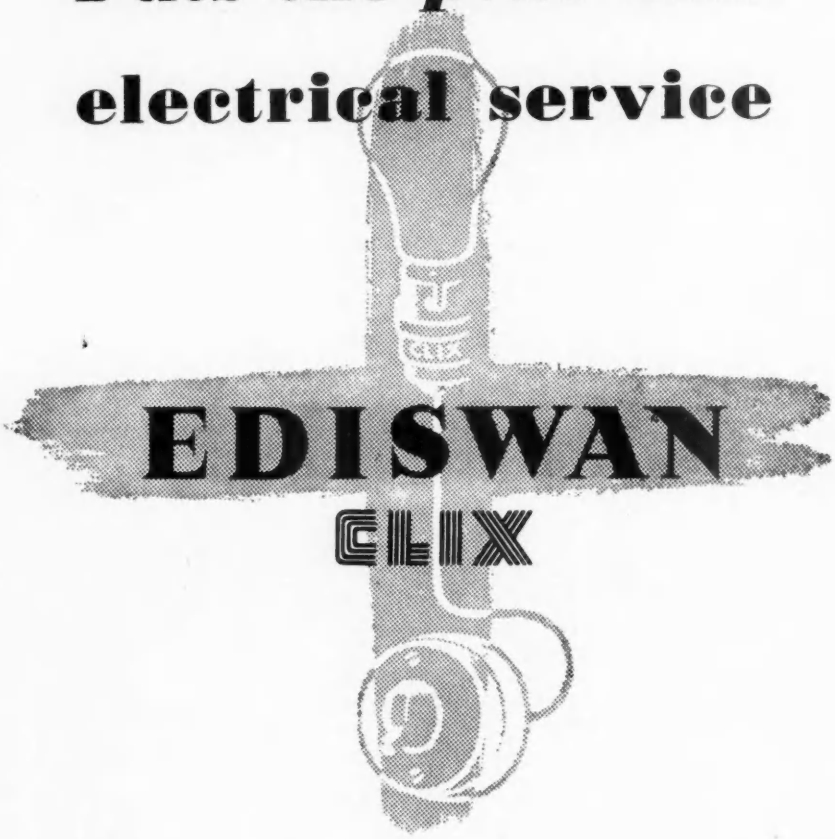

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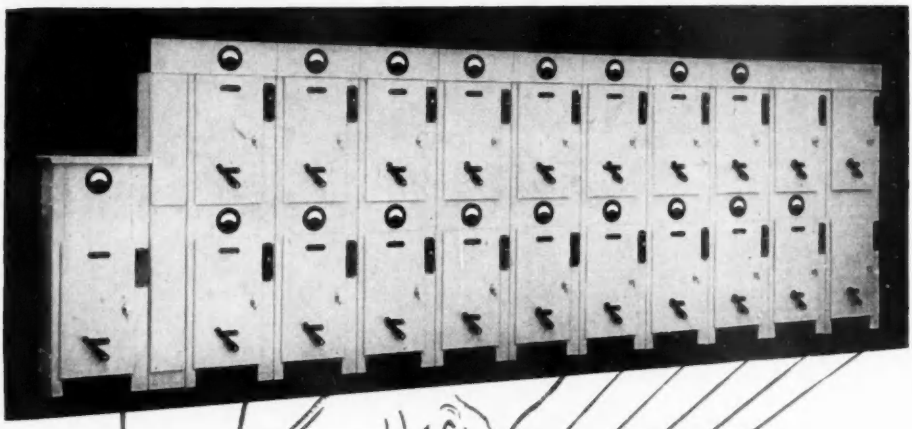

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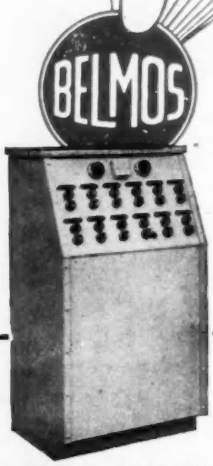

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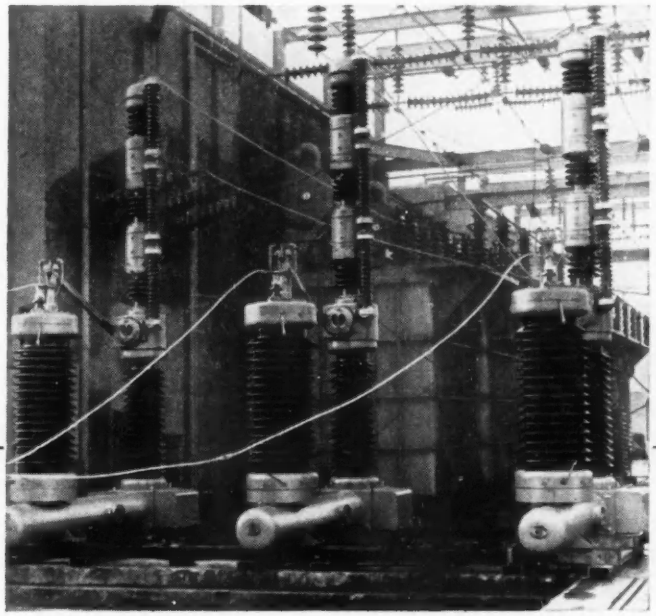
Unit construction under test



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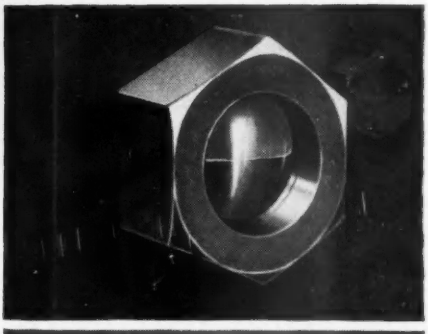
SH 4

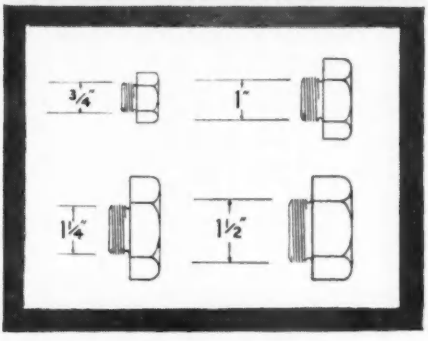
B T-H

'WINDONUT'

Glass-steel inspection window



The BTH *Windonut* provides a peep-hole through a mild-steel wall, a most convenient form of inspection window for oil-level indication and similar applications, at a very low cost. The special glass used was developed by BTH, and is fusion-sealed into the steel nut with which it forms an integral part. The *Windonut* is easily installed—virtually unbreakable—neat in appearance—available in four sizes, for ¾", 1", 1¼", and 1½" B.S.P. thread.



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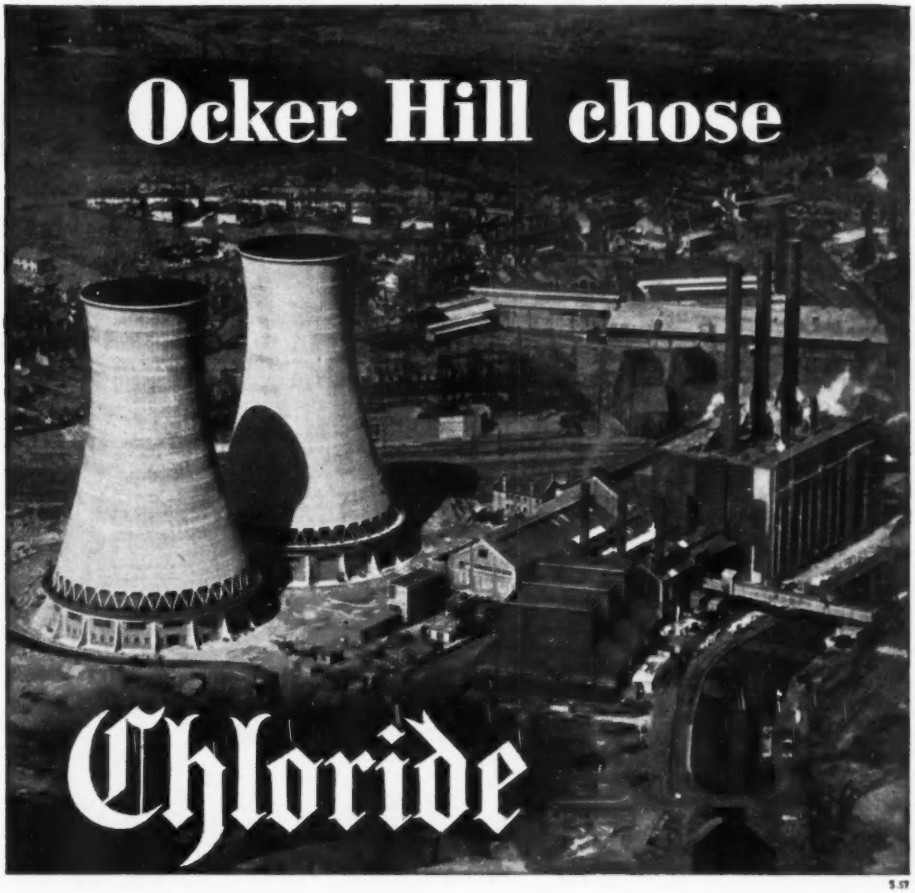

S.17

The battery installation at Ocker Hill, one of the main Generating Stations of the British Electricity Authority, Midlands Division, was provided by Chloride Batteries Ltd. The battery, which is used for emergency lighting, switch operating and switchgear indicating lamps, comprises 115 Chloride Planté cells type GLW12 in wood lead-lined containers and has a capacity of 1,200 ampere-hours at the 10 hour rate of discharge. It is maintained on trickle-charge by charging gear designed and installed by Chloride.

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MK 62

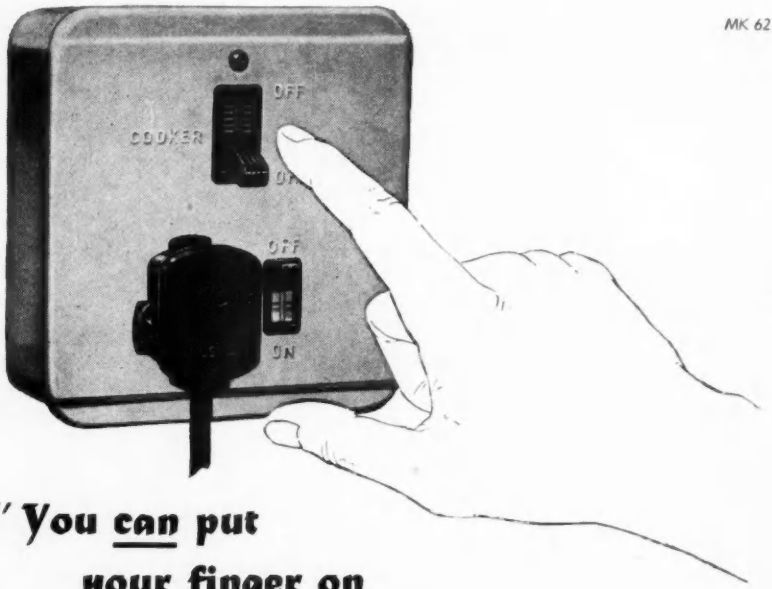

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Illustration is List No. 5080/646 surface cooker control unit

MK ...The mark of leadership

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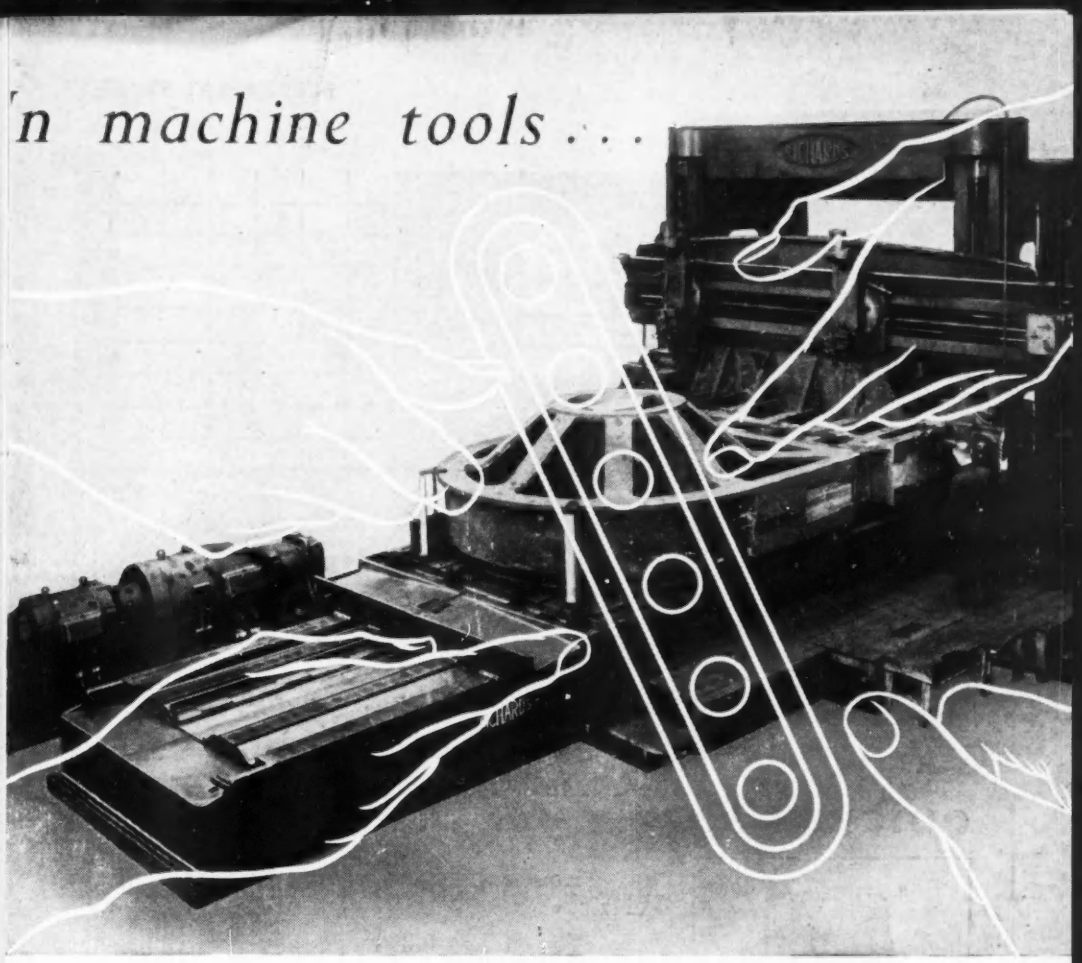

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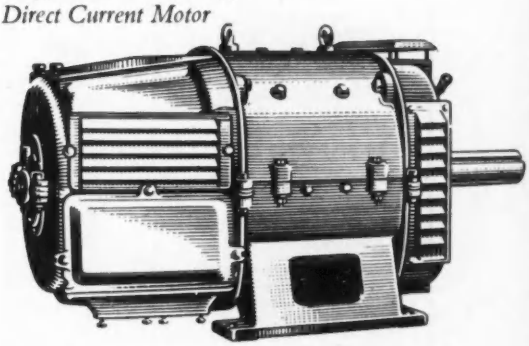

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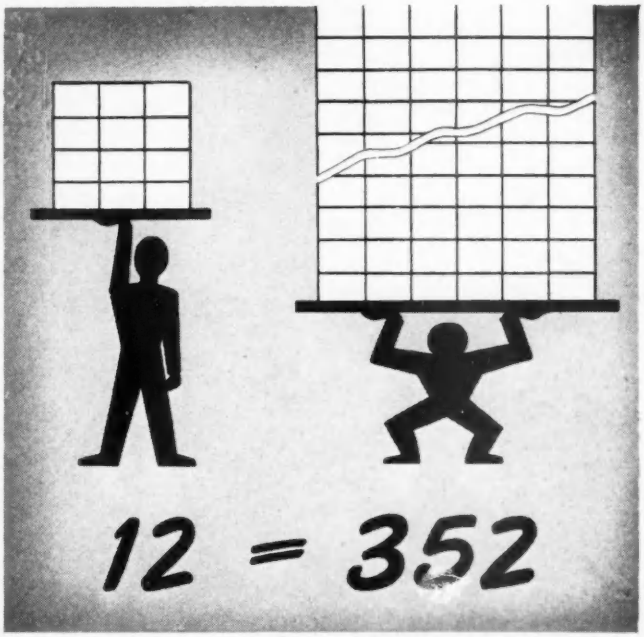

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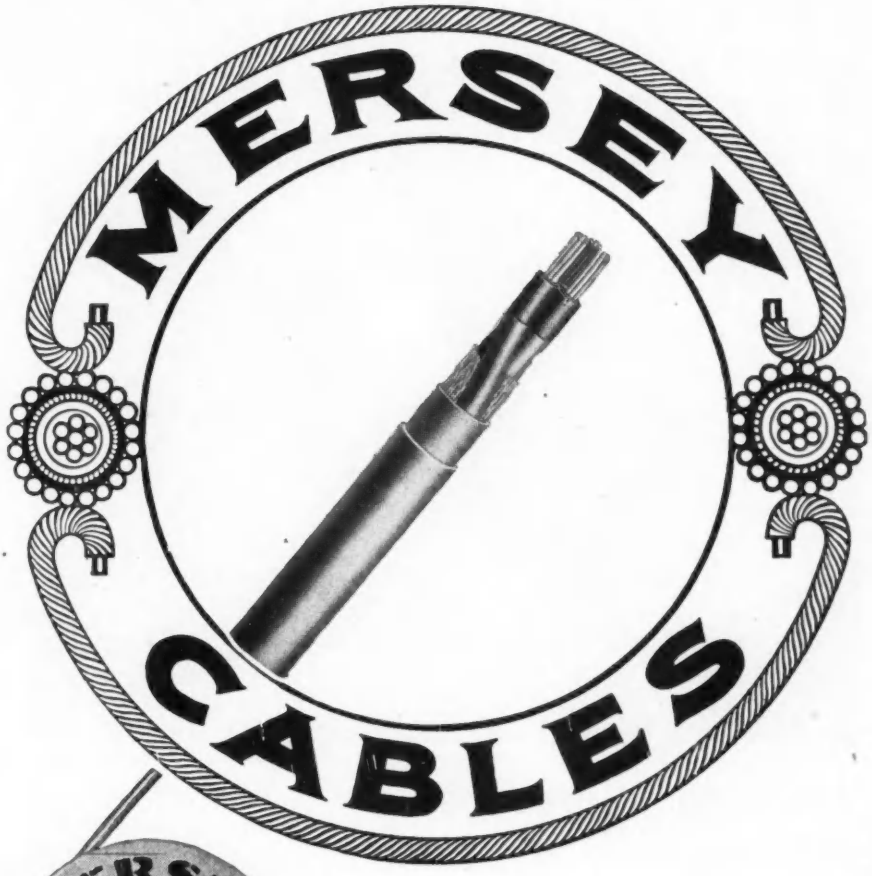

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ELECTRICAL TIMES

SIXTY-FIRST YEAR OF PUBLICATION

Vol. 121 No. 3164 THURSDAY, 26 JUNE, 1952

PUBLISHED EVERY THURSDAY

CURRENT TRANSFORMERS AND THEIR OPERATION
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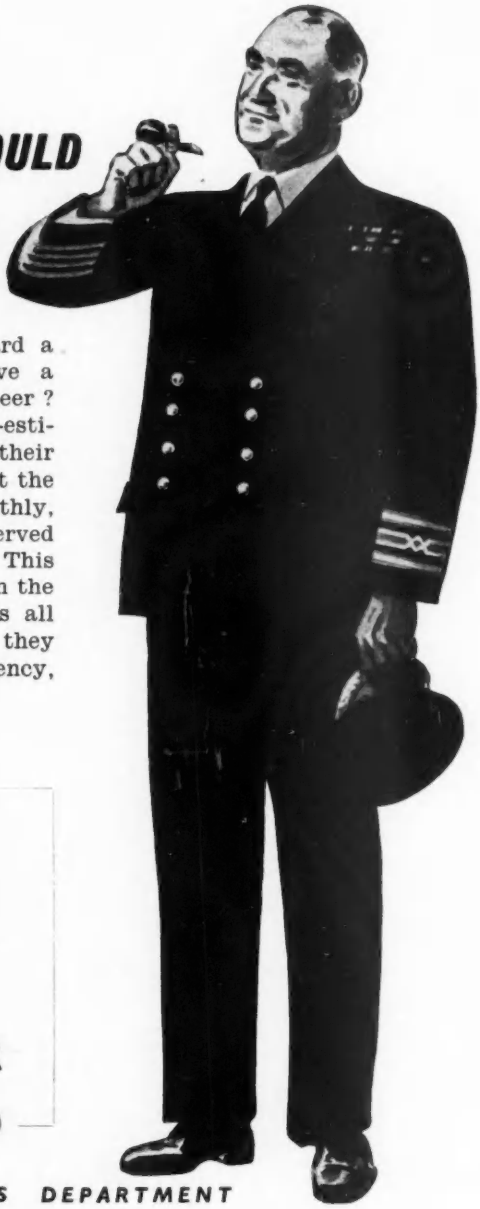
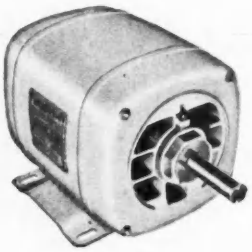
WITHOUT HIM THEY REALLY *WOULD* BE ALL AT SEA!



Of all the passengers aboard a liner, how many ever give a thought to the ship's engineer? Yet it is impossible to over-estimate his contribution to their welfare and comfort. In just the same way — quietly, smoothly, meticulously—Industry is served by the Hoover F.H.P. Motor. This is a 'fractional' that has won the confidence of manufacturers all over the world. They know they can trust its quality, efficiency, and dependability.



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Editorial

CUSTOMERS ARE WELCOME

PRESSURE for sales should soon be the public policy of the supply industry towards the domestic consumer. This startling but welcome change from recent practice is suggested as likely by statements made during last week's Bournemouth Power Convention. Delegates heard Mr. C. T. Melling claiming that in respect to generating capacity, the position had been reached where a campaign to develop the domestic load could be carried through without endangering supplies to industrial consumers. The key to this signal for action came from Lord Citrine who, later in the week, told B.E.A. representatives that the low rate of increase in sales of electricity was giving rise to concern. To a Convention newly reminded in a memorable paper of the dependence of the industry's economic structure on the domestic load as a foil to the poor load factor of industry's demands, these words indicated a new attitude to the sale of units. To try to increase output has always been the natural approach of the industry, and engineers have fretted uneasily under the negative attitude that recent events have forced on them. A return to forceful selling should do much to improve morale, and thus improve smoothness of working in an industry that has rediscovered its true purpose.

RENAISSANCE

A READINESS to fight back was well in evidence at a Convention, which outside criticism had shocked into life. Discovery of a driving sense of purpose overcame the handicap imposed by an over-full programme which cramped both formal and informal discussion. In the result, the Convention achieved a success which marked its advance on its immediate predecessors. In keeping with this atmosphere was the popularity of the year's innovation, the Electrical Forum. This version of radio's "Any Questions," presented at a high executive level, attracted a large and appreciative audience, which found especially welcome the willingness of the panel of experts to discuss questions frankly and forcibly. These qualities will not be easy to maintain, but if their endurance can be secured, then a favourite has been added to Convention week programmes. All in all, the Convention moves on for its second visit to Torquay with a new high standard to maintain, but with both invaluable enthusiasm and a sense of achievement as auguries for success.

CANADA GOES AHEAD

LAST Wednesday, a new chapter was opened in the sorry story of vacillation and procrastination which constitutes the history of the St. Lawrence Seaway scheme; for on that day, the American Senate rejected by 43-40 the ratification of the project. The decision was not unexpected and an immediate reaction was shown by the announcement that Canada would proceed with the Seaway scheme alone. But the question of power generation, an essential adjunct of the scheme, remains to be clarified. Both America and Canada agree that it is vital to exploit the St. Lawrence hydro potentialities, and as far as the Canadians are concerned the responsibility for this development has been given to the Ontario H.E. Power Commission. In the United States, however, the allocation of responsibility is still being argued. The New York State Power Authority, which is most directly concerned, has been refused a licence to co-operate with Ontario by the Federal Power Commission, and the American Interior Department has expressed the view that the power scheme should be a federal project. The Authority has appealed, and a decision is awaited. But until this decision is given, no detailed planning is possible, and it is by no means certain that the powerful interests which

have combined to defeat American participation in the Seaway scheme, will not attempt to prolong the internal dispute on power generation.

LIGHT ON THE DESK

OFFICE lighting provides a significant load for electricity supply systems and valuable business for fittings manufacturers and installation contractors. Thus there is ample reason for electrical engineers to give close attention to any authoritative report on the standards to be observed in this sphere. The most recent of the Ministry of Works' Post-War Building Studies, which discusses office lighting, has its importance enhanced by the inclusion of a sampling survey of the position in regard to such installations. From the extensive range of information presented, one of the outstanding statistics demands special mention. Only about half of those office workers interviewed who had incandescent lamps said that they could see well. It is probable that an even lower proportion had desk-level illumination of the recommended strength. These facts suggest that in regard to office lighting there is scope for sales promotion by manufacturers and contractors with a theme of adequate illumination; if this were successful it would, incidentally, present the B.E.A. with an increased load of the type that no one suggests it should not supply. Point is lent to this possibility by the endorsement the Ministry's Committee gives to existing recommendations of the Gowers Report on non-industrial employment, that there should be statutory requirement of "suitable and sufficient" lighting in offices.

ARE UNITS TOO CHEAP?

THE plea that electricity for domestic consumers is too cheap is a popular cry from those who have alternative fuels to offer. At first sight the average revenues per unit would seem to lend support to this view, but a more detached study such as that made by Mr. Sanders in his paper at Bournemouth provides a reason for this difference. It would have been useful if this paper had been available to the author of the article on tariffs in last week's *Economist*. This article, accepting the view that the domestic load is to blame for the peak, echoes the cry of "too cheap," but carefully qualifies it as applying to peak load hours only; at the same time mention of the corollary that the price at off-peak times would correspondingly be too dear is conveniently avoided. The author takes the B.E.A. to task for not adopting some suitable method of charging domestic consumers for the cost of peak load supply, but after considering various metering proposals, they are agreed to be too costly and the remaining recommendation is less "promotional tariffs," by progressing towards a flat rate with special terms for off-peak loads. The B.E.A. is censured for the view that such price differences are unlikely materially to affect peak demand, and substantiation for such a view is called for. Has the author forgotten so soon the failure of the Clow surcharge in just these circumstances? It would seem to *Meteor* that the author has misread the whole function of the tariff structure. His plea to make prices work, to give the pattern of load the industry requires, is just what has been done since the Hopkinson tariff was first introduced. It is the method by which the domestic load factor was built up to its present value.

FREE TRADE FOR ELECTRICITY

HAS electricity a superiority complex? Have we engineers so clothed ourselves in such scientific armour and technical jargon that only the Area Board's quarterly bill forces on us a realisation of the sordid commercial side? If further evidence is required that electricity is no more, no less, than an ordinary commodity, the Danish import regulations will provide it. There, amongst tailors' chalk, ants' eggs and other articles vital to modern civilisation, will be found the simple entry "electric currents." What is more, this appears in the Global Free List. Thus any country in the world is free to import electricity into Denmark without licence. Such features as high voltage transmission are only a question for the sordid technical side.

Meteor

CURRENT TRANSFORMERS *and their operation*

A METHOD OF CALCULATING THE OVERALL ERRORS OF NON-SIMILAR UNITS USED TOGETHER IN VARIOUS COMBINATIONS

By A. A. HALACSY, D.Sc, A.M.I.E.E., Mem, A.I.E.E.

THE calculation of errors resulting from the use of non-equal current transformers is always a difficult problem. In the following analysis the author uses a graphical method to show how these errors may be computed, both in phase and magnitude, from a knowledge of the turns ratio and the load.

In order to simplify the mathematical presentation, the following conventions have been used. Subscripts 1 and 2 refer to primary and secondary windings respectively; the subscripts A and B refer to the transformers "A" and "B" respectively; subscript "nom" stands for nominal, and where **Clarendon** type has been used the quantities are vectorial.

The symbols used are as follows:

K_n = Nominal ratio of whole set.

VA = Total VA of internal and external burdens.

Z_w = Impedance of the internal burden (winding) in ohms.

Z_{ex} = Impedance of external burden in ohms.

I = Current in amps.

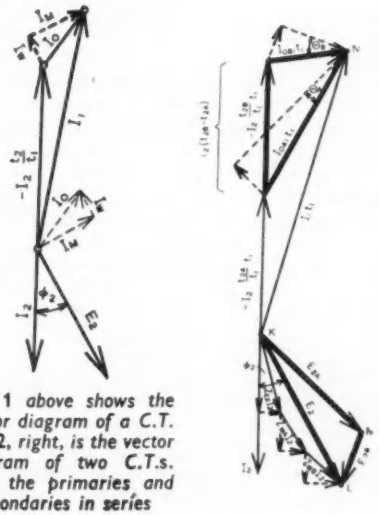


Fig. 1 above shows the vector diagram of a C.T. Fig. 2, right, is the vector diagram of two C.T.s. with the primaries and secondaries in series

E = Voltage in volts.

t = Number of turns.

A = Cross section of iron core in sq. ins.

l = Mean length of the path of the magnetic flux in the iron core in inches.

B = Magnetic induction, peak (Kilogauss).

H = Magnetising force, peak (Oersteds) $= H_{com} \cdot \cos \Theta$

H_{com} = Complex magnetising force, peak $= tI/1{\cdot}44l = t\sqrt{(I^2_{mag} + I^2_{watt})}/1{\cdot}44l$. (Oersteds)

Θ = Argument (phase angle) of the complex permeability.

μ = Modulus of the complex permeability.

φ = Phase angle.

Fractional turn-adjustment

In any current transformer, turn adjustment in the secondary winding is a common practice in order to balance the ratio error due to the magnetising current. Now one turn adjustment in a 200/5 amp, bar-type C.T., means a reduction of the 40 secondary turns to 39. Of course, this 2½% reduction may shift the ratio error from too big negative values to positive values. However, those positive values may be too big again. That is to say that the absolute value of the ratio error will not be improved.

Now, by connecting a 40-turn C.T. in series with a similar, but 39-turn C.T., one may expect to achieve a one half-turn adjustment: an alluring idea, particularly in the case of a double ratio C.T. made up by the series-parallel connection of two C.T.s. Unfortunately in practice the case is not so simple: the result is not a half-a-turn adjustment. Nevertheless, it is an adjustment by some fraction of a turn.

The resulting ratio—and phase angle—errors can be worked out graphically only, and not arithmetically, because the magnetisation curves of the usual iron-cores cannot be expressed by a simple algebraic equation.

Vectors of series connected C.T.s

Fig. 1 shows the usual vector diagram of the voltages and currents of a single C.T. Fig. 2 is

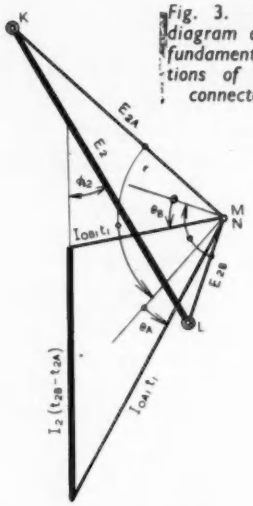


Fig. 3. The vector diagram of the four fundamental equations of two series connected C.T.s

derived from Fig. 1 and shows the voltages and ampere-turns of two C.T.s, the secondaries and primaries of which are connected in series. Ampere-turns are used instead of amps in Fig. 2, in order to avoid the unpleasant use of different scales in the same figure which would arise if the secondary amps were converted to the primary side by multiplying by the different turn ratios of the two C.T.s (40/1 and 39/1 respectively in the above example).

In Fig. 2 the internal voltage drop is $\mathbf{Z}_{wA}\,\mathbf{I}_2$ and $\mathbf{Z}_{wB}\,\mathbf{I}_2$ respectively in the secondaries and the external voltage drop is $\mathbf{Z}_{ex}\,\mathbf{I}_2$ in the burden. The total voltage drop is $\mathbf{E}_2 = \mathbf{VA}/\mathbf{I}_2$ and differs

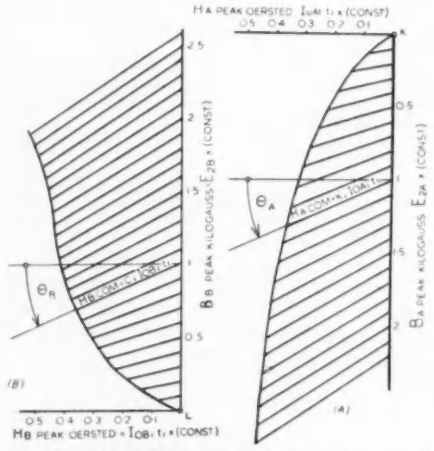


Fig. 4. "Complex" magnetisation curves of 0·014 in. thick Stalloy

from $\mathbf{I}_2$ by φ_2 in phase. $\mathbf{E}_2$ is made up vectorially by the e.m.f.s of the two individual C.T.s.

$$\mathbf{E}_2 = \mathbf{E}_{2A} + \mathbf{E}_{2B} \quad \ldots\ldots\ldots\ldots (1)$$

The numerical value of the e.m.f. in a C.T. is generally $E_2 = B.t_2.A/80$. Accordingly

$$E_{2A} = B_A t_{2A}\, A_A/80;\ E_{2B} = B_B t_{2B}\, A_B/80 \quad \ldots (2)$$

The values of the complex magnetising forces are

$$H_{Acom} = B_A/\mu_A;\ H_{Bcom} = B_B/\mu_B \quad \ldots\ldots (3)$$

and they are directed at angles Θ_A and Θ_B leading to $\mathbf{B}_A$ and $\mathbf{B}_B$ respectively.

The total magnetising ampere turns $I_0 t_1 = t_1\sqrt{(I^2_{mag} + I^2_{watt})}$ required in the primaries in order to produce those H_{Acom} and H_{Bcom} magnetising forces, are

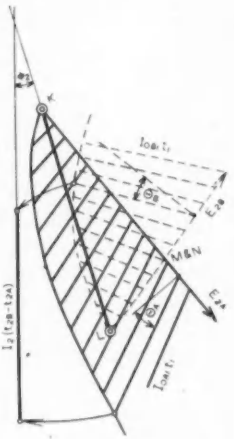


Fig. 5. This illustration shows the graphical procedure adopted to find the total magnetising current and the errors in a set of two C.T.s in series

$$I_{0A1}.t_1 = 1{\cdot}44\ H_{Acom} l_A;\ I_{0B1}.t_1 = 1{\cdot}44\ H_{Bcom} l_B$$

or substituting the values of the H_{com}'s and B's from the above equations (2) and (3)

$$I_{0A1}\, t_1 = (1{\cdot}44 \,.\, l_A \,.\, 80/t_{2A}\, A_A/\mu_A) \,.\, E_{2A} \quad \ldots (4)$$

$$I_{0B1}\, t_1 = (1{\cdot}44 \,.\, l_B \,.\, 80/t_{2B}\, A_B/\mu_B) \,.\, E_{2B} \quad \ldots (5)$$

each of them being unidirectional with the respective $\mathbf{H}_{com}$.

The secondaries are connected in series, therefore the same current must flow in them: $\mathbf{I}_{2A} = \mathbf{I}_{2B} = \mathbf{I}_2$. Consequently the vectors of the ampere turns $\mathbf{I}_{2A}\, t_{2A}$ and $\mathbf{I}_{2B}\, t_{2B}$ and their difference, too, are unidirectional. The difference of those ampere-turn vectors is shown in Fig. 2, and it is

$$\mathbf{I}_2\,(t_{2B} - t_{2A}) = \mathbf{I}_{0B1}\, t_1 - \mathbf{I}_{0A1}\, t_1 \quad \ldots\ldots (6)$$

Graphical Calculation of Magnetising Current Errors and Voltage Distribution

The ratio—and phase angle—error can be calculated by well-known methods from the total magnetising current (which is the vector sum of the pure magnetising current and the

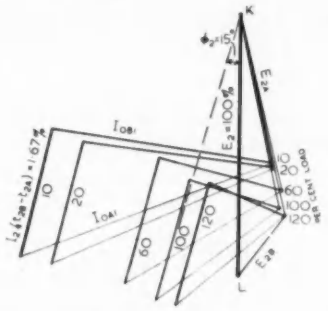


Fig. 6. The total magnetising current and the distribution of the e.m.f. in a set of two series connected C.T.s at 10, 20, 60, 100 and 120 per cent load. Nominal ratio 300/5 amps, 15 VA, $t_{2B}=60$, $t_{2A}=59$ $t_1=1$

watt loss current), $\mathbf{I}_{0A1}$ or $\mathbf{I}_{0B1}$. Equations (1), (4), (5), and (6) combine to form a set of four independent equations and obviously can be solved for the four unknown quantities $\mathbf{E}_{2A}$, $\mathbf{E}_{2B}$, $\mathbf{I}_{0A1}$, $\mathbf{I}_{0B1}$. That means we can have not only the total magnetising currents required for the calculation of the errors, but also the distribution of the e.m.f. between the two C.T.s.

The equations are vector-equations and $\mathbf{H}_{com}$ is an experimental vector-function of **B**. Consequently the only practicable way of the solution is a graphical "trial and error" method.

Shifting the triangle KLM of the vectors $\mathbf{E}_2$, $\mathbf{E}_{2A}$ and $\mathbf{E}_{2B}$ (drawn thick in Fig. 2) parallel to itself up to a position where the point M coincides with the point N, we get Fig. 3, which contains all vectors concerned and therefore can be used for solving the problem as follows.

Two graphs shown in Fig. 4 are drawn on transparent paper. Those graphs represent the vector-relations

$$\mathbf{I}_{0A1} \cdot t_1 = f(\mathbf{E}_{2A}) \text{ and } \mathbf{I}_{0B1} \cdot t_1 = f(\mathbf{E}_{2B})$$

for the C.T.s named "A" and "B" respectively, and as explained above in connection with equations (2), (3), (4) and (5). These graphs are drawn easily from the values or curves of the modulus and of the argument of the complex permeability given by manufacturers of magnetic materials. The graphs differ in scale only from the graphs of $\mathbf{H}_{Acom}=f(\mathbf{B}_A)$ and $\mathbf{H}_{Bcom}=f(\mathbf{B}_B)$ respectively. Care must be taken as to the direction of the angle Θ_A and Θ_B.

The next step is to draw a line KL equal to the length E_2 measured in the scale of the graphs of Fig. 4. We pin the point K of the transparent graph shown in Fig. 4A to the end point K of the line, and the point L of the transparent graph Fig. 4B to the other end point L of the same line (Fig. 5). We rotate the two transparent graphs around their fixing pins K and L respectively and watch the distance between the end points of $\mathbf{I}_{0B1}t_1$ and $\mathbf{I}_{0A1}t_1$, both of those being based on the momentary point of intersection MN of their base lines $\mathbf{E}_{B2}$ and $\mathbf{E}_{2A}$ respectively. As that distance reaches the length and the direction of $\mathbf{I}_2$ $(t_{2B}-t_{2A})$, we read the momentary values of $\mathbf{E}_{2A}$, $\mathbf{E}_{2B}$, $\mathbf{I}_{0A1}$, $\mathbf{I}_{0B1}$ from the transparent graphs. Those values are the solution of equations (1), (4), (5) and (6).

The phase angle and turn ratio error can be measured direct from the end point of the reversed "nominal" $\mathbf{I}_2t_2$ vector (Fig. 2) just as in any Moellinger diagram. (The reversed $\mathbf{I}_2t_2$ vector is anti-directional to $\mathbf{I}_2$ and has a length equal to $\mathbf{I}_1t_1$.)

Simplifications in the Practice

In many practical cases it is possible to simplify the procedure. It may be supposed not only that $\mathbf{E}=\mathbf{E}_A+\mathbf{E}_B=$const., but also that $\mathbf{B}_A+\mathbf{B}_B=$const. as well. The error made in the **B**'s due to such a supposition is in most cases less than 1%, whereas the supposition enables one to use **B**'s instead of **E**'s in Fig. 4.

In the same Fig. 4, $\mathbf{H}_{com}$ can be used instead of It's if $l_A=l_B$, which is the case nearly always found in the practice.

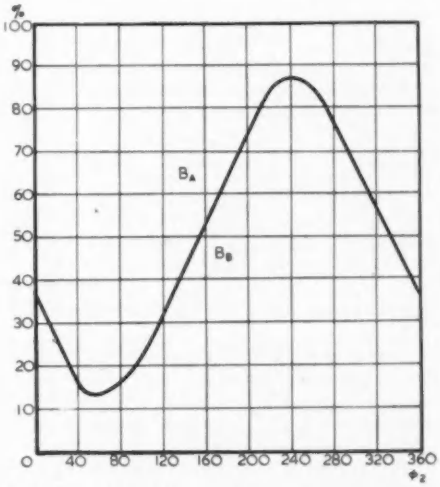


Fig. 7. Load distribution between two series connected ring-type C.T.s plotted against the phase angle of the load. C.T. "A" has 39 whereas "B" has 40 secondary turns nominal ratio of the set is 200/5 amps, 15 VA. Iron core built of Stalloy

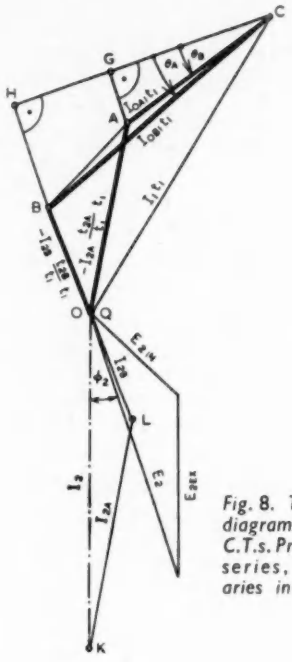


Fig. 8. The vector diagram of two C.T.s. Primaries in series, secondaries in parallel

Applying both propositions simultaneously, the graphs of Fig. 4 can be reduced to the vector relationships $\mathbf{H}_{Acom} = f(\mathbf{B}_A)$ and $\mathbf{H}_{Bcom} = f(\mathbf{B}_B)$ which can be drawn for a certain kind of material once for all, and used for all C.T.s built of the same magnetic material. The curves presented in Fig. 4 are actually such curves of 0·014 in. thick Stalloy.

Investigation of Load Conditions

For different loads, such as are 120%, 100%, 60%, 20% and 10% of full load as requested in the BSS, both Fig. 4 and Fig. 5 can be drawn in different scales, the length of E_2 being kept the same, "100%." This procedure results in a more accurate and more visual representation (Fig. 6).

Going another way, E_2 can be drawn equal to its numerical value for each load. In this case the same Fig. 4 can be used throughout and the length of E_2 changes in ratio with the load.

It is interesting to notice how more and more of the increasing load is carried by the C.T. having the smaller turn-number.

Variation in the phase angle of the load alters the distribution of the e.m.f. among the two C.T.s considerably. The method presented enables an easy check of that. Results of such a check are shown in Fig. 7 for a set of two series-connected C.T.s, nominal ratio 200/5, $t_{2A} = 39$, $t_{2B} = 40$, $t_1 = 1$.

Vector Diagram of Two C.T.s, Secondaries Parallel

Fig. 8 shows the vector-diagram of two C.T.s, primaries in series, secondaries in parallel.

The total voltage drop is $E_2 = VA/I_2$ and differs from I_2 by φ_2 in phase. This drop is composed of one $E_{2exA} = Z_{ex} I_2$ in the external burden and of one $Z_{wA} I_{2A} = Z_{wB} I_{2B}$ in the secondary windings. The voltage drop must be the same in each secondary because of their parallel connection, and so must be the e.m.f.

$$\mathbf{E}_2 = \mathbf{E}_{2A} = \mathbf{E}_{2B} \quad \ldots\ldots\ldots\ldots (7)$$

That means $\mathbf{E}_{2A}$ and $\mathbf{E}_{2B}$ are known once $\mathbf{E}_2$

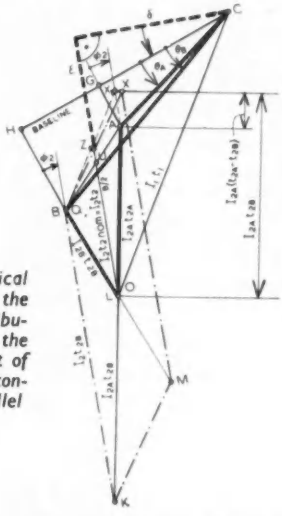


Fig. 9. Graphical calculation of the current distribution and of the errors of a set of two C.T.s. Secondaries in parallel

was given. It automatically follows that the magnetic induction in each C.T. can be calculated from the well-known general equation of a C.T. (see equation 2),

$$B_A = 80\, E_2/A_A\, t_{2A} \quad B_B = 80\, E_2/A_B\, t_{2B} \quad \ldots (8)$$

Both the numerical value and the direction of the magnetising force H_{Acom} and H_{Bcom} can be calculated by equation (3) and using μ and Θ given in data-charts of the respective magnetic materials. Equations (4) and (5) give the values of $I_{0A1}\, t_1$ and $I_{0B1}\, t_1$, too. These latter values combined with μ and Θ enable the construction of the two triangles CGA and CHB respectively in Fig. 8. The vector **BA** results from those triangles. On the other hand, the vector

diagram of the set shows the same vector BA being

$$\mathbf{BA}=\mathbf{I}_{2A}\,t_{2A}-\mathbf{I}_{2B}\,t_{2B} \quad \ldots.(9)$$

$\mathbf{I}_{2A}$ and $\mathbf{I}_{2B}$ are not yet known. However, there is known their vectorial sum which is the total current in the secondary burden,

$$\mathbf{I}_2=\mathbf{I}_{2A}+\mathbf{I}_{2B} \quad \ldots.(10)$$

The numerical value and the phase angle of that $\mathbf{I}_2$ have been given at the start. Multiplying equation (10) by t_{2B} we have

$$\mathbf{I}_2 t_{2B}=\mathbf{I}_2 t_{A2B}+\mathbf{I}_{2B}t_{2B} \quad \ldots.(11)$$

Equations (9) and (11) are a set of two independent equations. Consequently the two unknowns $\mathbf{I}_{2A}$ and $\mathbf{I}_{2B}$ can be calculated from them. It seems to be advisable to calculate graphically because of the vectorial character of those equations, as follows.

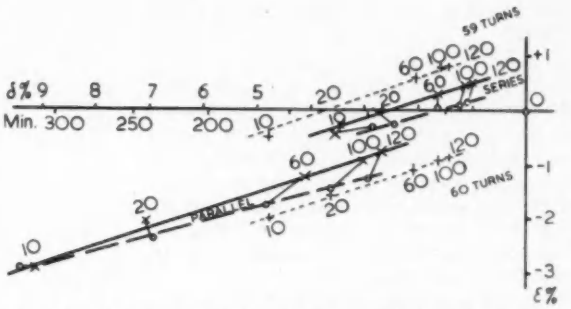


Fig. 11. Full lines = calculated errors, dashed lines = measured errors of a set of two C.T.s identical with the one calculated in Figs. 6 and 10. Short dashed lines = calculated errors of the single C.T.s composing the set.

First, the sides of the triangle QLK can be increased t_{2B} times, and second that increased triangle representing ampere turns and drawn to the scale of other ampere turn-vectors in Fig. 8 can be shifted upwards so that its apex Q reaches the point B. As a result of that shift the side BO of the triangle ABO and the side QL of the triangle QLK coincide and LK is a straight continuation of AO, as shown in Fig. 9. Consequently we can draw a line $\mathbf{I}_2 t_{2B}$ long from B and in the direction given by φ_2, thereafter connecting its end point K with the point A and dividing AK into AO and OK in a ratio so that

$$\mathbf{AO} : \mathbf{OK}=t_{2A} ; t_{2B} \quad \ldots\ldots\ldots(12)$$

As a result of that procedure Fig. 9 shows

$$\mathbf{OB} : \mathbf{OK} : \mathbf{BK}=\mathbf{I}_{2B} : \mathbf{I}_{2A} : \mathbf{I}_2 \quad ..(13)$$

which means the numerical values of $\mathbf{I}_{2B}$ and $\mathbf{I}_{2A}$ can be measured directly from Fig. 9 once $\mathbf{I}_2$ was given and a right scale used.

In most of the practical cases, due to the small angle between the direction of $\mathbf{I}_{2A}$ and $\mathbf{I}_{2B}$, the ratio of the latter ones is approximately

$$\mathbf{I}_{2A} : \mathbf{I}_{2B}=t_{2A} : t_{2B}$$

Calculation of the Errors

The total error of the set is the difference between the verices of the vectors $\mathbf{I}_1 t_1$ and $\mathbf{I}_2 t_{2nom}$ where the "nominal" secondary turn-number is $t_{2nom}=t_1\,K_n$ and K_n is the nominal ratio (e.g. $K_n=150/5$).

Usually t_{2nom} differs either by none or by one or two turns from the half of t_{2A} and t_{2B} respectively. Suppose $t_{2nom}=t_2B/2$. In this case Fig. 9 shows the triangle BOK being a quarter of the rhomboid BKMX which is easily drawn by completing the half-diagonals OB and OK. The point X is reached by measuring the length $\mathbf{OK}=\mathbf{I}_{2A}t_{2B}$ (not t_{2A}) from O into the opposite direction, i.e. along a line laid across the point A. There appears the distance $\mathbf{AX}=\mathbf{I}_{2A}\ (t_{2A}-t_{2B})$. In practical cases the direction of **AX** will differ but negligibly from that of $\mathbf{I}_2 t_{2B}$ or $\mathbf{I}_2$. Furthermore, it follows from the properties of the rhomboid BKMX that $\mathbf{OZ}=\frac{1}{2}\mathbf{BK}=\mathbf{I}_{2B}\,t_{2B}/2=\mathbf{I}_{2B}\,t_{2nom}$.

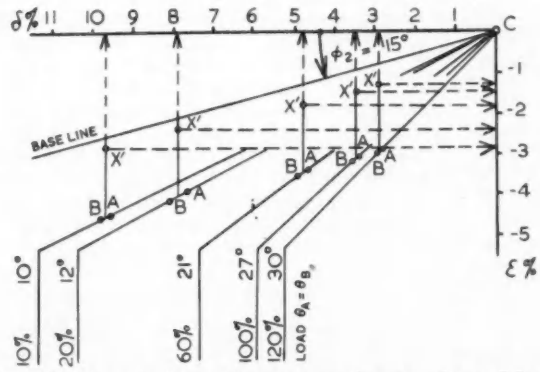


Fig. 10. The calculation of the errors of a set of two C.T.s, secondaries parallel at 10, 20, 60, 100 and 120= per cent. load. Nominal ratio 150/5 amps, 15 VA, $t_{2B}=60$, $t_{2A}=59$, $t_1=1$. In the drawing 150 amp. turns = 100 %. $I_2\,(t_{2A}-t_{2B})/2=2.5$ amp.turns.

These observations lead to an easy graphical way to find the error of the combined set of the two C.T.s as follows.

(1) Draw $\mathbf{CA}=\mathbf{I}_{0A1}t_1$ and $\mathbf{CB}=\mathbf{I}_{0B1}t_1$ from a common point C,

with angles Θ_A and Θ_B respectively to a base line CG.

(2) Draw a line from A and at an angle φ_2 to AG. Mark the point X′ on that line and in the distance I_{2A} (t_{2A}—t_{2B}) from A. X′ is toward G if $t_{2A} < t_{2B}$ and in the opposite way if $t_{2A} > t_{2B}$. Half the distance BX′, that point is Z.

Or, with good approximation: halve BA and mark that point by U. Measure I_2 (t_{2A}—t_{2B})/2 from U at an angle φ_2, and reach Z that way. This does not require the knowledge of the value of I_{2A} and I_{2B}.

(3) The total error of the set is ZC because $OC = I_1 t_1$ and $OZ = I_2 t_{2nom}$. That total error can be divided into the ratio error ε collnear with the direction of I_2 and the phase-angle error δ, normal to I_2 as shown dashed in Fig. 9. Using appropriate scales, those errors can be read in % and in minutes immediately from the drawing.

Fig. 10 presents such a drawing based on data as follows: $K_n = 150/5$ amps, $I_1 = 150$ amps, $I_2 = 5$ amps, $t_1 = 1$, $t_{2A} = 59$ turns, $t_{2B} = 60$ turns, $t_{2nom} = t_{2B}/2 = 30$ turns, t_{2A}—$t_{2B} = 1$ turn, $I_{1t}t_1 = I_2 t_{2nom} = 150$ ampere turns, 1% of ε or $\delta = 1{\cdot}5$ ampere—turns, 1% of $\delta = 1$ centiradian $= 34{\cdot}38$ minutes. Choosing the scale such as to keep the length of $I_2 t_{2nom}$ the same for each load, the scale of ε and δ is kept the same as well. Starting the construction from the same point C in the case of each load, the drawing results in the Moellinger diagram of the set.

Fig. 11 shows how far the calculation matches with practically measured values of the error in both cases dealt with above.

Further prospects of the method

The method presented is suitable for the working out of errors and load distribution in cases where not only the turn numbers but also the iron-cores are different. Such a difference influences the multipliers of E_{2A} and E_{2B} in equations (4) and (5) and results in alteration of the scale only of the corresponding graphs in Figs. 4 and 5.

Our readers' views ...

A Policy for Fuel

IT is not my wish to trespass further on your valuable space as the observations made by your correspondents, J. T. Barfield, who loves to poke among the embers and L. Giltrow, who implies that there is virtue in domestic drudgery, do not merit serious replies.

My statements are those of a practising housewife for the past 27 years and no evidence has been given by either of your correspondents, to cause me to alter my conclusions.

SURBITON *Mary E. Byrne*

◆ ◆ ◆

I WAS entertained by the conservatism which shines through Mr. Giltrow's letter. He says the new grates are cleaner to use than the old ones, but surely this is merely comparative.

No one can handle coal and ashes without producing dirt and dust. No one can get along with these methods without the attention and help of the sweep. No one having lighted a fire in a house can feel entirely free, and always at the back of their minds must be the thought that at some time it must be stoked.

I often wonder how the solid fuel or gas salesmen would get on in the world today if electricity had come first and if all our houses contained only electrical appliances. I cannot imagine how the salesman would set about his job. Would he say, "I have some black carbonaceous stuff here which you can hump on to a grid affair called a grate and after a little trouble this will give you heat. Of course, it may be a little dirty and variable, but it will make a nice flame which I can assure you will not be dangerous if looked after properly." In the same way, if the housewife with the all-electric house had not heard of gas, how would the gas salesman explain that to use his product it would be necessary to bring gas (with some odour) into the house by means of a pipe and light flames at the end of burners in order to cook or produce heat?

I do not think either of these salesmen would get very far, but they can get away with it in these days because they started first and have a great and all-powerful ally, conservatism.

BRIGHTON *R. E. Gamlen*

Load and the Area Boards

THOSE present at the B.E.P.C. at Bournemouth last week heard an excellent exposition on the merits of electricity for cooking, water heating and space-heating. Much of this was a useful reiteration of well-known facts, one of the most significant being that such utilisation

of electricity was useful and necessary to ensure a balance between industrial and domestic loads.

Now—let something be done to implement all that was said; I suggest that the Area Boards should start the ball rolling, particularly those who still maintain restrictions on the sale of equipment in their Service Centres and whose Commercial Departments are not able to accept heating loads much as they would like to—because of instructions from Area HQ.

The manufacturers are ready and anxious to help to ensure that electricity is back once again in its rightful position in a national fuel policy. If the lead comes from the supply authorities, then the manufacturers will not be slow to take advantage of that lead.

C. B. Cleland

WELWYN GARDEN CITY

Coal Handling

I VENTURE to suggest that the contributions on the above subject are confusing two completely separate aspects of the problem:

(1) Hoppered, self-discharging wagons versus the normal design of vehicle.

(2) Larger wagons.

The point at issue is the hoppered wagon, and while I support wholeheartedly the self-discharging wagon, I recognise that arguments exist against this type of vehicle. I should like to set out these arguments as I see them.

For the hoppered vehicle:

(1) More simple equipment at the unloading point—a hopper between or beside the rails, depending upon the design of truck, either centre- or side-discharge.

(2) No power required for unloading.

(3) More rapid unloading.

(4) Less accurate "spotting" of the truck required, compared with some dischargers.

(5) Less damage to trucks when discharging.

(6) A more rigid truck body can be provided.

(7) Problems of clearance between fixed structure and moving wagons and locos eliminated, with greater safety to workers.

(8) Simple and cheap foundation work.

(9) Maintenance work at discharge point greatly reduced, as is the consumption of consumable stores—oil, grease, waste, etc.

(10) Trucks need no longer be fitted with the non-spill axle-box.

Against the hoppered vehicle:

(1) The hoppered wagon is suitable only for bulk loads. Their use would probably increase the "return-empty" train mileage.

(2) For the same size frame and wheelbase, the hoppered truck holds less coal than the normal wagon. Their use would therefore entail a larger number of trucks for the same carrying capacity, with an increase in siding accommodation at both ends of the journey, longer and heavier trains, and more fuel expended by the locomotives.

(3) Hoppered trucks would present some difficulty in unloading where the special facilities which they require do not exist.

It should be noted that item (2) against the hoppered wagon applies to all wagons, whatever the capacity. If a 40-ton wagon of hoppered type is compared with a normal design of 40-ton vehicle, it will be found to take up a greater length of track. While there may be advantages, therefore, in increasing the size of wagons, there remains against the self-discharging wagon the disadvantage of extra size above that of the normal design.

The arguments against hoppered wagons concern their movement from point to point, which is the problem of the Railway Executive, while their advantages, with one exception, assist the industrialist. Is this the real reason for the brief dismissal by the Railway Executive of the hoppered wagon, as reported by Mr. J. D. Harrison? It would be very useful, although quite beyond my own limited capacity, to evaluate the relative advantages of the two types of vehicle in this country.

S. C. Herbert
B.Sc. (Eng.), A.M.I.Mech.E
M.Inst.Gas E.

HONOR OAK

Output Incentives

FROM those who are likely to derive benefit, there have been frequent suggestions that the only way to increase productivity would be to make income tax concessions on overtime. It is surprising, however, to have support of this theory from such a high level as a speaker at the recent convention. The immediate result would be to reduce output during normal working hours so as to ensure that overtime would be necessary. In any case such a scheme, if put into force, would be a grave injustice to the people who have been carrying this country on their backs for the last five or six years. I refer to the salaried executive grades, both in private enterprise and the nationalised industry and who normally work all the hours necessary for conscience sake and no other incentive.

If it ever does happen that overtime is exempt from income tax then I for one will try to persuade my employers to pay me at hourly rates.

A. J. Wyndham Roberts

LONDON, W.3.

Notes on Wiring
by MEGOHM

50 Years Ago

How Much Have Times Changed ?

IN 1899 the Electrical Contracting Industry, I am told, was hampered by a multiplicity of conflicting rules and regulations and contractors, in some cases faced with three sets of regulations, found themselves in an untenable position.

On the Continent and in America wiring in those days was almost entirely enclosed in steel conduits, whereas in England on account of grandmotherly enactments, petty bye-laws and unreasonable restrictions, work was largely being carried out on antiquated methods using wood casing, compo pipes or lead sheathing. The first step for simplification and uniformity of wiring rules, it was stressed, must be agreement on the necessary requirements for an interior wiring system, and with due respect to high authority,the rat-tight, gas-tight and water-tight arrangements advocated at this time could hardly be taken seriously by practical engineers. A water-tight conduit system was an unattainable ideal and there was no doubt that moisture due to sweating and condensation would cause trouble unless provision was made for exit.

The question of price is brought to the fore by the statement that it was useless to reduce the price of electricity per unit if the cost of wiring was to be kept up to £1 a light. It was recognised that conduit and fittings would have to be sold at a figure to enable the contractor to erect an installation at a cost not more than it would cost if wood casing was used.

Steel Conduit

In 1900 buildings were being wired with cables enclosed in steel conduit and it was suggested that this method bid fair to solve the question of the most efficient wiring system combined with all-round economy. Steel conduits and fittings in ½ in., ⅝ in., ¾ in., ⅞ in., 1 in., 1¼ in., 1½ in. and 2 in. diameter size available at this time were made in the following grades: (a) Light gauge butt joint enamel steel conduits. (b) Light gauge brazed enamel steel conduits. (c) Light gauge butt joint galvanised conduits. (d) Heavy gauge screwed enamel steel conduits.

The function of a conduit is to provide complete mechanical protection to the cable, and iron or steel was most satisfactory and economical for this purpose since, by using steel, the gauge could be reduced, always providing an ample margin was left so that in the event of an accidental arc occurring in the conduit, the circuit fuse would blow before the heat generated could raise the temperature of the conduit to a harmful extent. Opposition to the longitudinal seam in conduits subsided since results obtained by practical experience under varying conditions of surface work, in plaster and cement proved more conclusively than all theoretical deductions that the longitudinal seam was not a bad feature. In damp and wet situations, such as bathrooms, lavatories, etc., galvanised conduits were recommended, it being emphasised that the galvanising practically closed and metallically united the butt edges of the conduit.

Slip Tube Preferred

Two systems of conduit work were available, "the socket method" and "the screwed method." The former which most of us know as slip tube was advocated as the best method for interior wiring because of economy in labour.

In support of "the socket system" a large firm in the north of England wrote in 1900 that their factory wall, on which a run of cable in conduit was fixed, collapsed. The falling debris opened the conduit joints but the cables remained undamaged. They say had they used any form of screwed joint the cables would have been broken.

I doubt if anyone today will subscribe to the reason given for: (1) *not unduly reducing the gauge of steel conduit*, (2) *placing reliance on galvanising sealing the butt joints of slip conduit and* (3) *advocating the use of slip socket joints in preference to screwed joints. Other matters in relation to regulations, costs and development of new systems, of course, do not make unfamiliar reading even today.*

Convention Record

Delegates were kept busy by a full programme during three-day meeting at Bournemouth

REFRESHING breezes off the sea, matched by invigorating speaking at the meetings, characterised last week's B.E.P.C. gathering at Bournemouth. As had been predicted, the three days allocated for this event proved too little time to contain comfortably all the events that had been planned, but the consequent hustle was an appropriate accompaniment to the new sense of urgency which was everywhere apparent.

An unavoidable result of the shortening of the Convention was the use of one meeting-place on Monday and another on Tuesday, an unfortunate necessity which made the Convention office less a centre of activity than usual. This was the more to be regretted since the Hunter-Hazell collection of cables of historical interest had been specially brought from the Science Museum and was on show in the office. Nevertheless, in spite of the twin handicaps of temporary accommodation and a whole day's work to compress into an hour or so, the Convention staff dealt ably with registration problems, and the first meeting got under way only a few minutes late.

The proceedings up to Monday evening were reported and illustrated in last week's issue of the ELECTRICAL TIMES. On Tuesday morning, the delegates met for the first time in the Pavilion Theatre to hear Dr. R. S. VINCENT deliver his well-illustrated lecture on "High Performance Dielectrics." The feature of this lecture, which we summarised last week, was its demonstrations and the lengthy colour films which illustrated it. A remarkable array of electrostatic apparatus was assembled on the stage and ably operated by Dr. Vincent's two assistants.

The Pavilion will be familiar to readers who were at the Convention

At lunch time on Tuesday came the second of the social events that are such enjoyable features of each Convention. This was the E.A.W. luncheon, held under the chairmanship of the Association's president, Lady Swaythling. The speeches at this function began with the toast of "The Borough of Bournemouth." Proposing this, Mrs. A. T. DOVER, B.SC., E.A.W. chairman, in a happy turn of phrase compared the Conference venue to the Association: both had been of rapid growth, and both brought health and light to women. The Mayor, making an appropriate response in which he echoed sentiments expressed at Monday's civic welcome, recalled that Marconi had received his first messages from across the Atlantic on a small island in nearby Poole Harbour.

Beauty and Science

"Beauty in this Scientific Age" was the toast proposed by the Convention president, Mr. P. V. HUNTER, who, while admitting that there were aspects of beauty in it all, reserved the right to prefer the products of a bygone time for aesthetic appeal. Mrs. CONSTANCE SPRY, the well-known expert on flower arrangement, responded, and in an entertaining speech, which appeared to please the ladies greatly, included some suggestions on the possibility of

illuminating flower groups in the home by spotlights and other means.

Seven papers proved altogether too much for the afternoon session on Tuesday, when the Convention theme, "Research," was considered. Though authors kept closely to their allotted 15 minutes of summary time, and even managed to add some useful and interesting demonstrations to their papers without exceeding this limit, there was only 20 minutes left for a discussion which might well have filled a valuable hour and a half.

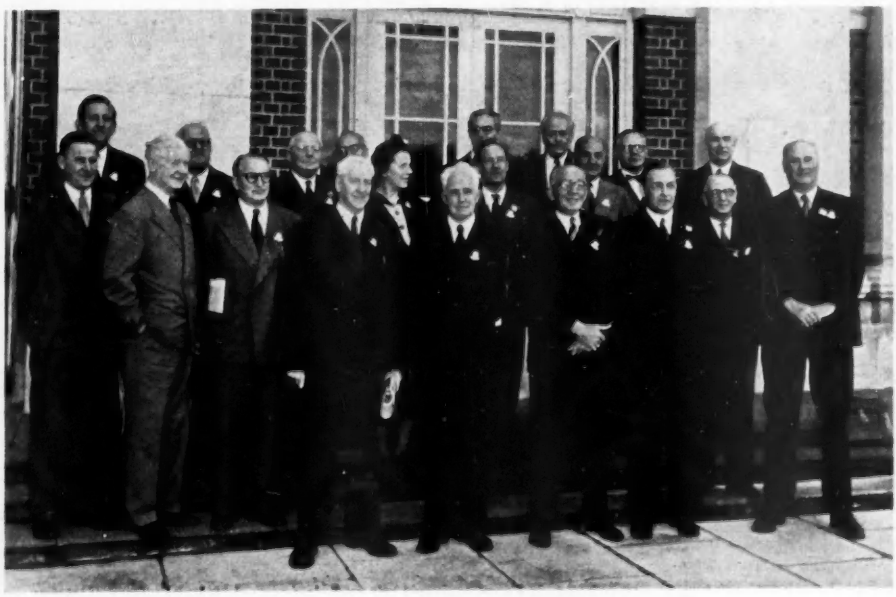
Research Discussion

All speakers in this discussion emphasised that they were not presenting their full case; that would have to wait for the printed proceedings. Dr. DUNSHEATH (W. T. Henley's) opened, and suggested that the session was unique in the history of research exposition. Speaking quite generally, he wondered if individuals responsible for developments in industry had been given the real credit they deserved.

Mr. E. B. WEDMORE (E.R.A.) said that the aspect of first importance commercially was the securing that research discoveries were put in production quickly. An advantage of co-operative research was that it brought together research workers and the executives who were responsible for making use of the results of investigations. Mr. D. P. SAYERS (B.E.A.) felt that the papers read conveyed an air of complacency about what had been done in research. There were many problems to be attacked including, in his opinion, that of the circuit-breaker. This should have a current-limiting feature, then it would not have to withstand the stresses associated with full fault current. Then there was the question of transmission lines: it cost £100,000/year to paint towers, and involved lines being put out of commission. This should give room for improvement, as should the low (50%) efficiency of insulator strings.

Mr. J. A. VICE (W.T.B.A.) noted that with a 100 MW unit boiler working on base load, and using a coal with 0·01% content of a deleterious substance, then in 11 months of steaming, some 30 tons of this compound would have to be dealt with. If only 1% "stuck" to the seven acres of heating surface, the engineer would have 6 cwt to deal with. That was the type of problem that faced the Boiler Availability Committee. Mr. G. N. GREEN (E.E.B.) said that there were many cases which showed that the supply side of the industry had pressed the manufacturers to try out new products. He asked for attention to the possibility of screen-type cables for 11 kV use. Mr. J. O. KNOWLES (B.E.A.M.A.) thought that medium-sized firms should give

The Council of the Convention assembled at the Pavilion for this photograph



From top to bottom are seen Mrs. Constance Spry speaking at the E.A.W. luncheon, Ald. J. R. Potts and Mr. B. E. Leeson inspecting the Hunter-Hazell cable collection, and Viscount Swinton speaking at the annual dinner

more support to the E.R.A., and that the E.R.A. should in turn help them by giving more verbal explanation of ideas. Mr. SHERBORNE (B.E.A.M.A.) claimed that there was a creditable amount of information available on condenser tube corrosion and erosion.

Annual Dinner

Principal guest at this year's annual dinner of the B.E.P.C. was the Rt. Hon. VISCOUNT SWINTON, G.B.E., C.H., M.C., Chancellor of the Duchy of Lancaster and Minister of Materials. As is the usual custom, he spoke to the toast "The Electrical Industry." He said that there was a greater scarcity of materials than many people realised. You could have scarcity because materials were in short supply, and this was the position in regard to sulphur, nickel and copper for as long as rearmament continued. Beyond this, however, it was possible to have scarcity because of the need to harbour resources.

Britain was very lucky to have Empire sources of metals in Rhodesia. Producers in that country had played the game very well, but there would still have to be emphasis on substitute materials. After an excursion into criticism of power station architecture, Viscount Swinton returned to the subject of metal supplies. He wanted to free markets wherever he could, but where this was impossible, he would work through the trade. But it had to be remembered that the balance of payments problem transcended all others, and made it impossible to take even slight risks.

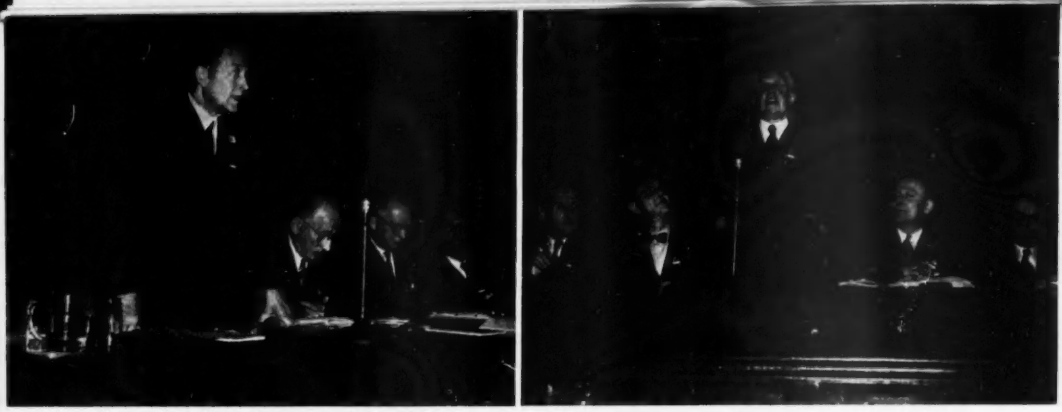
It had been agreed with the Treasury that the market price of metals should be adopted for Government selling, though there was an exception in respect of the increased price of copper. The price could be kept down partly because of the help of Empire producers. Capacity to buy metals depended on exports, and here the electrical industry set a shining example. Large exports to Canada, which had been achieved, were particularly welcome.

His lordship made some complimentary comments on Mr. P. V. Hunter's presidential address, especially concerning the remarks on relationships in industry. He suggested that the more workpeople knew about business, the less they would want to run it.

Responding to the toast, Mr. P. V. HUNTER said that the industry received the news of the setting up of a Ministry of Materials with great relief. What had been said by Viscount Swinton had given that Ministry a whole host of thorough-going supporters. All were greatly pleased to have heard the human way in which the Minister was tackling his problems.

Speeches in a lighter vein came from Sir HENRY SELF ("The Guests") and Sir WILLIAM WALKER (*in* reply).

On Wednesday morning, there was an exceptionally full attendance of delegates to listen to



Sir John Hacking (left) and Mr. J. R. Beard accepting nomination as president and vice-president respectively of the British Electrical Power Convention for the coming year

a panel composed of Sir John Dalton, Mr. J. R. Beard, Sir Vincent de Ferranti, Mr. C. Melling, Sir John Hacking and Mr. S. F. Steward discuss questions sent in for the "Electrical Forum." The president acted as chairman and question master, and led off with : "Is it desirable in the national interest, to have competition between area boards or to have co-ordinated power supplies?" Mr. Melling suggested that the two ideas were quite compatible. Under present conditions it would be quite wrong to go back to unco-ordinated undertakings. Co-ordination should, however, be limited to persuasion; if guidance was unwise, co-ordination would hinder.

Sir John Dalton suggested that area boards were too big; co-ordinating them was like organising an egg and spoon race for elephants. Mr. Steward wanted competition, but on a given basis of fairness about conditions, etc.

Energy Interchange

Question two dealt with the matter of exchanging electrical energy with the Continent. So far as France was concerned, Sir John Hacking expected a decision within two weeks as to whether development measures would be put in hand. He was less optimistic about Norway, as this project was only practicable with d.c. transmission.

No, said Mr. Steward in reply to another question; restriction on domestic space heating and other uses of electricity was not necessary to secure an adequate supply of power for industry. Just the opposite was the case if an economic supply was to be ensured. Sir John Hacking backed this up with an assurance that the majority of domestic consumption came off the peak.

In relation to the size of generating sets, Sir John Hacking had no doubt that only rarely should sets smaller than 60 MW be installed. The standard size should be 100 MW straight and 120 MW reheat. Factors such as adoption of unit boiler system combine with coal quality to make it unwise to exceed this size by much at present. Mr. Melling warned against too much concentration on development at the expense of current production.

Consultative councils came under attack from the industrial members of the forum during the discussion of another question, but the area board representatives testified to their effectiveness, Mr. Melling said that they were an experiment, but one that was working out pretty well.

Co-operation between the B.E.A. and manufacturers again came into question in a discussion on obtaining experience of plant operating at 400 kV, a.c. and d.c. Sir John Hacking said that already there was much co-operation in regard to a.c. transmission at this voltage. The position as regards d.c. was more difficult. The Authority was co-operating technically, and might be prepared to go further, but most of the cost of experimental work would have to come from manufacturers since there was little likelihood of d.c. transmission being needed in this country.

Finally, in the discussion there was general agreement that it was in the public interest for industries to co-ordinate their activities through trade associations, though Sir John Hacking suggested that there were possibly too many manufacturers in the country of some types of heavy equipment.

The popularity of the Forum ensured that there was a well-filled theatre for the Convention A.G.M. which followed. The delegates welcomed the nomination of Sir John Hacking as the new President of the Convention, and of Mr. J. R. Beard as the vice-president. Torquay was accepted as the venue for the 1953 Convention, which is being arranged for the week commencing Monday, June 8. There was general agreement amongst delegates that the next Convention should last a full week.

B.E.A. Report

With the completion of the A.G.M., and the passing of the usual votes of thanks, the Convention proceedings proper came to an end, but on Wednesday afternoon was held a private meeting of British Electric delegates. At this gathering, Lord Citrine gave his usual review of the past year's events in the industry. He began with a few words about the investigation of the organisation of the industry, on which a special committee had been engaged, and said that so far as the Central Authority's activities were concerned, some definite conclusions would be presented for consideration in the near future. Since the industry was an expanding one, no redundancy should result from any action taken as a result of this report.

Preliminary estimates of financial results for 1951/52 indicated that there would be an overall deficit on the year's working of the area boards, and a net surplus on that of the Central Authority. For the industry as a whole there would be a net surplus, but taxation reserve would absorb most of this, and there would be no transfers to general reserves.

During the financial year 1951/1952, electricity sent out from the B.E.A. stations was 55,822 m. units, an increase of 6·4% on the previous period. More recently demand had lessened, and one result had been a chance to lessen the gap between generating capacity and potential demand.

Current Government capital investment plans limited the Authority to an annual installation of 1,550 MW of plant, and after 1955 this would be less than what was physically possible. New plant was at present costing £64 per kW. Materials shortages were causing concern, especially steel. If the 275 kV Grid had not come into partial operation by 1956, the useful output of many new power stations would be limited.

Turning to the problem of fuel resources, Lord Citrine said that 60% of the coal burnt by the Authority was uncleaned slack of low heat content. Requirements for coal were estimated at 47 m. tons in 1960. By that time it was hoped that the average efficiency of generation would have increased to 26%.

In relation to area board operations, arrangements for testing load controlling devices on consumer's premises were in abeyance, while the matter was being further studied. Discussions had been resumed centrally between the B.E.A. and the E.C.A. concerning the agreement on the principles to govern electrical contracting, since some doubts have arisen about interpretation.

BRIGHTER OFFICES

RECOMMENDATIONS for the lighting of offices are given in a newly issued Ministry of Works Post-War Building Study.* Though some of the report applies to the daylighting of offices, much information is given on general requirements for artificial illumination.

For book-keeping, typing and other general office work, an illumination value of 20 lumens/sq ft is recommended, though this may be reduced somewhat when work is intermittent. For drawing-office work the value recommended is 30-50 lm/sq ft, for private offices 15 lm/sq ft, and for entrance halls 6 lm/sq ft. These recommendations are stated to agree closely with those of the Illuminating Engineering Society of Great Britain.

Sampling Survey

In connection with the committee's investigations, a sampling survey was carried out into workers' opinions of the lighting of offices. At the time of the survey (1948) it was found that 76% of those interviewed worked in offices with incandescent lighting, 19% fluorescent, and 5% both incandescent and fluorescent.

Fifty-nine per cent of all workers said that they could see well, 33% fairly well, and 8% badly. For those with fluorescent lighting the figures were 81%, 17% and 2% respectively, and for incandescent alone, 53%, 38% and 9%.

Discussing legislative aspects of office lighting, the report notes that the Gowers Committee, which enquired into health, welfare and safety in non-industrial employment, recommended that the parts of the Shops Act of 1934 which concerned lighting should apply to offices. By this move, occupiers would be required to supply "suitable and sufficient lighting." A general requirement of this type, which would be interpreted by inspectors, is one with which the committee preparing the present report found itself in full accord.

*"The Lighting of Office Buildings," published for the Ministry of Works by H.M. Stationery Office, price 3s. 6d.

Problems and Practice IN ENGINEERING

Pressure Switch Problem

WE have on our site an electrically operated cement elevator, feeding into a hopper. The elevator is automatically controlled by means of two pressure switches operated by the level of the cement in the hopper. At first, we experienced some trouble with it, and I write this explanation in the hope that it may assist any other maintenance man who is faced with a similar problem. Indeed, someone may have already faced the problem and found a different explanation and remedy. In that case I shall be very interested to hear about it.

The pressure switches consist of a rubberised canvas diaphragm which moves under the pressure of the cement. This operates a mercury switch, which is fitted to a plate fixed to the centre of the diaphragm. The switches are situated in the vertical side of the hopper, one near the top, the other near the bottom. When the hopper becomes full, the diaphragm of the top switch is pressed, and the mercury switch opens, thus breaking the circuit of the contactor coil in the starter, and stopping the elevator motor. As the cement is used, pressure is released on the diaphragm of the lower switch, and the mercury switch closes, thus operating the contactor coil, and the elevator starts again.

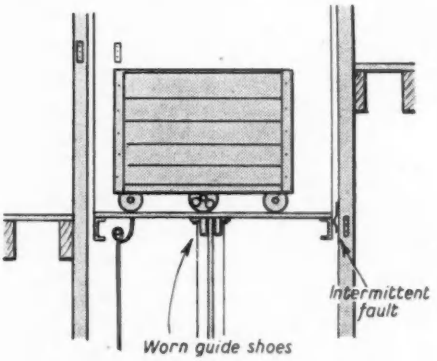
Trouble was experienced when we found that at odd intervals the elevator motor would stop before the hopper was full. On pressing the "start" button on the starter, the motor would start quite normally, only to stop again after running for about five minutes. As this occurred only at intervals, the solution to the problem was found only after careful observation over a period of several days. I discovered that when these periods of obstinacy arrived, the diaphragm of the top switch was being violently jerked, even though the cement coming over the top of the elevator did not touch it, and the hopper was less than half full. After watching this happen several times, I came to the conclusion that the movement of the diaphragm was due to extra air pressure caused by "bubbles" of hot air coming up the vertical elevator shaft with the cement. I proved this, and, as it happened, found a way of preventing the trouble, by leaving one of the inspection ports open in the top of the hopper. With the port open, the "bursts" of extra air pressure were able to escape, and the diaphragm remained steady until it was pressed in the normal way, when the hopper was full.

The elevator is now run with a "flap" of rubberised canvas over the port; this allows the extra air to escape, and no further trouble has been experienced.—*W.D.M.C.*

Hoist with a Hangover

FAULTS in wiring which have blown fuses often disappear when a test is taken. One such fault occurred on the push button wiring of a hoist I was called on to repair.

The hoist served displaced floors on two sides of the well, with heavily loaded barrows constituting the main traffic. T.r.s. wiring linked up the several gate locks, and push buttons, etc. As an insulation test showed infinity and the hoist was urgently required, the blown auxiliary fuse on panel was replaced.



Barrow on hoist car in fault position

Some hours later a repetition of the earlier fault occurred and it was observed that car was lying at the same floor as before. With demands on hoist easier, a search to locate fault ensued, and our efforts were rewarded.

The car guide shoes being rather worn caused the car to rock. As the heavy barrows were rolled off, the tilting car frame contacted the wiring on the opposite side of the well. This wiring, which projected too far, had had the insulation chafed through and with the car unloaded, the trouble cleared automatically. Corrective measures were adopted and no repetition of this fault has shown since.—*W. B.*

All About BOILERS

New research laboratories provide facilities for comprehensive investigations into steam raising problems

RAPID increases in operating temperatures and pressures, and in steaming capacities, have been recorded in boiler design during the past twenty-five years. These achievements have only been possible because behind the experience of operators, designers and fabricators there has been the analytical approach of scientists and technologists working in well-equipped research laboratories. As the search for greater efficiency and reliability in boiler plant continues, the need for such laboratories is intensified, and it was with this in mind that Babcock and Wilcox Ltd. soon after the war, began to plan a new research building.

Last month we were privileged to visit the completed establishment, which is essentially a two-storey building of modern design conveniently situated some 1¼ miles from the company's main works. The floor area of the main building totals some 22,000 sq ft, but another 5,000 sq ft is available in a temporary building, and extensions are already planned that will double the available accommodation.

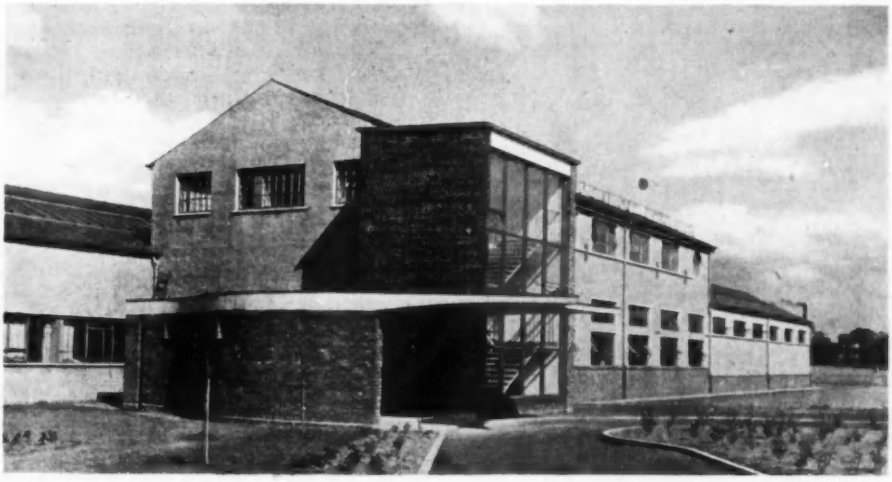
Before the new building became available, the research department was housed in the main works, and certain facilities for testing and investigation are still retained there.

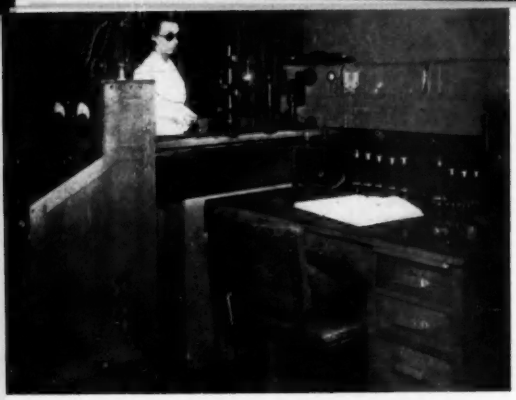
Metallurgy

Work in the laboratories can be divided into two main categories: long term development and basic research and the solution of problems arising in manufacture, erection and operation. In many ways, the metallurgical section is the centre for the latter type of activity, and a description of the laboratory may well begin here.

Routine examination of test plates taken from welded pressure vessels provides the greatest volume of work, and a "mass-production" technique of dealing with this has been developed. The preparation room where mounting and polishing are performed has obviously been equipped with this need in mind, and the range of microscopes available ensures that thorough examination is possible. A photographic department is available with an exceptionally wide range of facilities to set the seal on speedy execution of this routine work. Another works process which is checked by

The exterior of the new research centre of Babcock and Wilcox Ltd.





Spectrographic methods are used in routine testing

the metallurgical section is case hardening.

Long term work proceeding in this section includes investigation into methods of joining sections of ferritic and austenitic steel.

Amongst instruments noted in the metallurgical laboratory are several which make use of the alteration in magnetic and electric (resistive) properties of metals as their crystalline structure changes.

Chemicals and Fuel

Whilst the metallurgical branch is concerned with the structure of metals, the chemical branch of the laboratory gives its attention to the elements and compounds involved. It is estimated that routine analysis alone involves the examination of some 10,000 specimens every year, and to this has to be added all the work called for by long term projects.

Intensive use is made of spectrographic techniques for analysis, the spectrum of the light emitted by a spark being photographed when the substance under test is one of the spark electrodes.

In addition to the normal method of using the photographic plates to give a measure of the proportions of each metal present, the possibilities of direct readings being obtained, using a photo-multiplier, are under investigation. The whole room containing the spectrographic equipment has to be kept under thermostatic temperature control in order to maintain the accuracy of the large quartz prism used in the spectrometer.

Qualitative investigations proceeding in the chemical section include some relating to protection against corrosion and to resistance to scaling at high temperatures. For tests in connection with the latter investigations, solid bars of the metal concerned are suspended in the centre of an electric furnace, and flue gas (the active scaling element) is supplied from gas burners, with provision for injecting other gases as required. A travelling balance enables continuous weighing to be carried out, and experience allows results obtained over about 1,000 hours to be extrapolated to 100,000 hours under service conditions.

Since boiler design starts with a specification of the fuel to be burnt, the fuel testing section which is situated next to the chemical laboratory, has a task of the first importance to perform. It receives many hundreds of samples of fuel every year, and from each of these has to select a sample, perhaps one gram in weight, which will accurately represent the average composition of some hundreds of tons of coal.

When coal samples arrive, they are first air-dried and then ground in small mills to give a convenient particle size for testing. Rotary samplers are used so that any desired proportion of the original coal can be abstracted and still be representative of the whole. Grindability tests are carried out by starting with coal of known particle size and measuring the proportion which will pass a 200 mesh sieve after a given period of grinding. Calorific value is determined in a conventional bomb-calorimeter that is housed in a draught-proof cabinet and provided with a thermometer that permits temperature readings being taken to the nearest 0·001° F. Readings are taken through a small telescope.

Bomb calorimeters for fuel testing occupy draught-proof cabinets

Slags in their molten state are becoming increasingly important. This instrument checks their viscosity

Ash is investigated in the laboratory with reference to its fusion temperature, cones of finely ground ash being heated in a furnace for this purpose. Molten slags in which interest has increased because of the development of the slag-tap furnace, are checked for such properties as viscosity by measuring the drag they exert on a rod dipping into them as they are rotated.

An incidental duty of this section is research into water purity problems. Routine tests of steam purity are made by electrical conductivity methods, but for calibration purposes, evaporation to dryness is necessary. To permit this to be successfully carried out when salts present as one part per million of solution are of interest, a platinum basin is used to contain the water, and this is heated by radiant heaters placed above, so that no difficulty arises due to carry-over during ebullition. The whole unit is mounted in a dust-proof enclosure, and can deal with some 5 litres of condensate in 25 hours.

Combustion Research

There is still much to be learned about the way in which coal and other fuels burn, and one section of the research department is devoted to this problem. It is geographically widely spread, some incidental matters being dealt with in a room which adjoins the fuel laboratory. Here there is an X-ray machine which is used for diffraction crystallography work to determine the compounds present in deposits which form on water and steam tubes. Investigations are also proceeding here into the measurement of the temperature of furnace gases. The problem is that ordinary thermocouple methods cannot be used because the gases are radiating to cooler surfaces.

Two alternative methods have been developed. One, which is possible only at temperatures above 1,100° C, examines spectroscopically the light from an incandescent lamp after passage through the gas. If the lamp temperature is below that of the gas a characteristic sodium line is seen; when the lamp is the hotter, this line changes to black. The other method effectively measures the velocity of sound in the gas, this being known to vary as the square root of the absolute temperature. Two microphones are used, and a microsecond counter measures the interval between the sound of a detonation reaching first one and then the other.

Pilot scale work on combustion is carried out in a temporary building, in pots some 11 in. diameter standing on grates formed of actual grate bars. Provision is made for weighing these pots continuously as combustion proceeds and for measuring the temperature at various depths on the fuel bed.

Pressurised Combustion

Larger scale work is proceeding with spreader stokers, while another interesting development is work being carried out to determine combustion characteristics of solid fuel under pressure, so as to investigate the possibilities of pressurised boilers and the various combinations of steam and gas turbine cycles. This work is in two parts; small-scale tests are being made on unit combustion chambers using air supplied by a 460 h.p. compressor, and a larger plant is now built incorporating a Derwent III jet engine, fired by

Valuable information on fuel bed conditions is obtained with pot furnaces such as this

Extensive use is made of resistance strain gauges in the mechanical testing section

a slagging cyclone combustion chamber designed to burn about one ton of coal/hour.

Boiler Design

Mechanical details of boiler design are principally the concern of the engineering section of the research department. A wide range of techniques has been developed here for the accurate determination of stresses in metal structures. Electric strain gauges are well to the fore, and amongst the outstanding achievements of the section is the successful fixing of these instruments to the inside surfaces of pressure vessels being water tested at pressures up to 2,000 lb/sq in. The close analysis of the complicated stress systems existing in welded boiler drums has been made much more reliable by methods such as this.

Fatigue effects are of importance in boiler design as in so many other branches of engineering, and provision is made for investigating them by providing a plant which can give a pressure reversal of 2,000 lb/sq in., six times every minute. At present this equipment is installed in the header factory at Renfrew, but it is to be supplemented by a new plant which will be capable of 4,500 lb/sq in. reversals, 80 times/minute. This will be sited at the main research building.

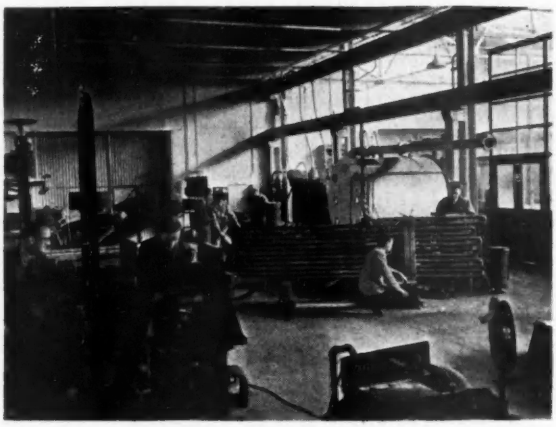
Qualitative experiments in steam separation are facilitated by having available a dummy boiler-drum fitted with inspection windows. The drum is provided with riser connections through which air and water can be pumped at velocities corresponding to those of the steam and water in an actual boiler. Turbulence is produced comparable with that in an actual drum, and the behaviour of different steam separating devices can be examined.

An example of the valuable practical results that may follow from this section's work is given by the discovery that the maximum stress in close radius bends of uniform thickness occurs on the inside. With reference to superheater tubes, this means that the natural thickening of the inside bend compensates for this effect, and that there is less need to allow for thinning at the outside bends by using thicker gauge tubes than would otherwise be necessary. Thus a valuable saving in material may result.

Electronics

As is to be expected, the latest developments in measurement techniques are not neglected in so well equipped a laboratory, and a subsection is devoted to electronics. Controllers and similar items of equipment are designed for the rest of the research department and for the works plant department, and development is carried out on the use of methods other than radiography for the examination of welds.

Close attention has been paid to the use of ultrasonics for this purpose. The problem is to extend this technique from its proved use-



General view of engineering research bay

fulness in the detection of faults of comparatively large area (such as slag inclusion) to the indication of relatively minute imperfections in welded plates. Amongst the methods under investigation is the use of a multi-crystal transmitter on one side of the test piece, with a single receiver on the other. By using scanning methods a pattern of spots can be presented on a c.r.o. display which readily denotes flaws.

The long term value of ultrasonic methods of testing, if successfully developed, lies in the restriction in the amount of radiographic examination which would be necessary. It is hoped that ultrasonic examination may become the standard procedure, with X-ray photographs taken only where some doubt is thrown on the soundness of the weld concerned. This is economically of great importance in relation to small drums, for which the cost of examination may be comparable with that of fabrication.

Mechanical Testing

Finally in this list of research sections comes that concerned with mechanical testing. It has as its basis a well equipped routine test laboratory, though its work extends to much investigation of a long term nature. A machine shop is attached to provide facilities for the preparation of specimens, and for general laboratory services as may be required.

Amongst the speedy methods used in the investigational laboratory is an electronic measurement of the modulus of elasticity. Small metal specimens are suspended horizontally from two glass silk loops, one of which is attached to a loud speaker diaphragm and the other to a gramophone pick-up. The speaker is vibrated over a range of frequencies, and the rod begins to resonate when the appropriate frequency is reached. A c.r.o. display is used to indicate the output of the pick-up, and from the resonance frequency so determined, Young's modulus is readily calculated.

Rupture testing on superheater tubes is carried out by two methods. In the first the tube material under investigation is kept in a thermostatically controlled electric furnace ($\pm$ 2° C) and subjected to appropriate tensile stress until failure occurs; 72 such testing units are available. The other method actually applies steam, fed at pressures up to 2,000 lb/sq. in. from an autoclave at any required temperature. Three machines, each capable of holding six specimens, are available for this work. Thermal fatigue tests on joints between alloy steels are carried out in an apparatus which alternately heats one side of the joint with an enclosing heating element, and then cools it with an air blast.

World Power Conference Report

DETAILS of activities in many parts of the world are given in the Annual Report of the World Power Conference for 1951. Particularly notable were co-operation with various United Nations organisations, and with the newly formed Union of International Engineering Organisations. Work has proceeded on the accumulation of statistics for the Conference's Year Book, and it is hoped next month to publish issue Number 6, containing information for the years 1949/51.

As the result of the A.G.M. of the British National Committee of the Conference, which was held last month, Sir John Hacking has become vice-chairman in succession to Mr. Harold Hobson. Sir Vincent de Ferranti remains chairman.

Forthcoming Meetings

This year the international executive conference of the W.P.C. is to meet in Chicago, during September. British representatives attending are expected to include Sir Vincent de Ferranti and Sir John Hacking, together with Dr. A. Parker, Sir William Halcrow, and Mr. C. H. Gray, secretary to the Council. The next sectional meeting of the Conference is to take place in Rio de Janeiro from July 25 to August 8, 1954. Papers at this meeting are to centre round the special energy problems of the tropical and sub-tropical countries. Subjects to be discussed include: planning of the electrical power industry (with special attention to general economics and to thermal power as a complement to abundant hydro energy); uses of electric power; power installation in tropical and sub-tropical regions; wind power, including its application to rural electrification; and international hydro-electric developments. This last item is to concentrate on the principles involved in hydro-electric developments of common interests to two or more countries.

Preparations for British participation in this meeting have already begun, and a papers committee has been set up under the chairmanship of Sir John Hacking.

The annual report is obtainable from the secretary of the W.P.C., 201, Grand Buildings, Trafalgar Square, London, W.C.2, price 1s. 6d.

The Engineer and his Position in Mining

—is Theme of the A.M.E.M.E. Convention

A FULL programme was enjoyed by delegates and their ladies at the 44th Annual Convention of the Association of Mining Electrical and Mechanical Engineers held last week at Blackpool.

The W. M. Thornton Lecture, was this year given by Sir Andrew Bryan J.P., D.SC., F.R.S.E. who dealt with Mines Inspection and Safety. In introducing the main subject of his address, he gave an historical review of the progress of legislation dealing with matters of health and safety from the early act of 1842 up to the present day. He pointed out that the 1951 edition of the Regulations and Orders made under the C.M.A., 1911 contained just 218 pages and was rapidly growing. There was great detail given to the duties of shot-firers and deputies, but the law did not dictate much detail to the mechanical and electrical staffs.

The use of electricity in mines was governed by Regulations framed over forty years ago when the electrical art was still young. That these Regulations were sound was borne out by the manner in which safety had been served. This experience should be carried in mind when discussing and settling the new code which had already been tabled. A subsidiary question was in relation to flameproof gear, the use of which had now spread from the coal-mining industry to oil and other manufacturing industries. With the consolidation of the art, and the accumulation of manufacturer and user experience was the same minute detail of test procedure still necessary, could simplification be brought in?

Mechanisation

Mr. E. H. Brown, Director-General of Production, N.C.B., dealt with the "Mining Industry's Challenge to Mechanical and Electrical Engineers." We were, he said, only on the fringe of the general modernisation of our collieries. There was a strong likelihood that more and more complicated machinery would be used, making new demands on colliery mechanical and electrical engineers, who also had their part to play in raising the efficiency of the industry. There was an important field for specialist engineers in colliery work. New entrants should have a good grounding in both electrical and mechanical engineering, and the industry should give a higher standing to engineers. In many collieries there was room for organising a system of planned maintenance to ensure continuity of efficient working. This was particularly applicable to underground plant and to electrical equipment.

Another point on which progress was needed was the establishment of central workshops for groups of collieries. These could be used to establish planned maintenance and would also provide facilities for training apprentices. There was a need now, and it would increase, for qualified engineers. The mining industry should also get its share of graduates from the universities.

Presidential Address

In the Presidential Address, delivered on Friday last, Mr. H. Watson-Jones, M.ENG., dealt with the more general problem of the engineer and mining, with particular reference to the activities of the Association. Research work in one form or another had been proceeding in the mining industry over the past 150 years. He would like to see the formation of a Technical Progress Committee within the Association which might collect and consider ideas and suggestions for technical improvements in mining equipment and processes. He emphasised that the Association had always had as one of its objects the advancement of engineering science as applied to mining and had held examinations and issued certificates.

He was in agreement with the findings of the N.C.B. productivity team and the U.N.E.C. observations on the need for skilled imaginative men to contribute to the solution of productivity problems. The search now was for new processes and new techniques. The most startling development in the future lay in the field of nuclear fission, years of research and development work would, however, be necessary before this source of power could be usefully and safely employed for industrial purposes on a commercial scale.

In conclusion he gave a brief description of the work and constitution of the Association which now had a membership of close on 6,000.

The St. Lawrence Seaway

CANADA TO PROCEED WITH PROJECT ON HER OWN

THE rejection by the United States Senate last Wednesday of the St. Lawrence Seaway and Power Project marked a victory for the powerful opposing interests which have hindered this development for over fifty years. As far as Canada is concerned, the Seaway has become of vital importance during the past two decades due to the opening up of rich oil and mineral deposits and the growing industrialisation of the Dominion, and in consequence it has been announced that the Canadian Government will proceed with the scheme single handed.

This immense project envisages a canal system capable of carrying ocean-going ships of 25½ ft draught from the sea to the Great Lakes, thus opening up the interior of the country. A large section of the work has already been completed. From the Strait of Belle Island to Quebec there exists a 35 ft channel; from Quebec to Montreal is a 32½ ft channel (which is being deepened to 35 ft) and from Prescott to Lake Ontario is a 27 ft channel. The main bottleneck in the present system lies in the international sections of the river at International Rapids and the Thousand Islands and is due to the limitations of the existing bypassing canal system which has a depth of only 14 ft. This will need deepening and the locks reconstructed.

Power Generation

Associated with the Seaway is an ambitious electrical scheme for harnessing the power of the river. Extra horse-power for hydro-electric generation is estimated at 2,200,000 at the International Rapids, 1,000,000 at Soulanges (which already has a station absorbing 1,000,000 h.p.) and 1,200,000 h.p. at Lachine.

Now, despite the full concurrence and approval of the President, the Seaway has been rejected at last by the Americans. The decision by the Canadian Government to proceed is complicated by the fact that many Canadian M.P.s who voted for the Seaway-Power project, were either against or non-enthusiastic for the Seaway itself, but were swayed by the hydro-power possibilities.

On the power side, international co-operation is vital, as the river is in an international zone, and here again the position is far from clear. In Canada, the government has given the responsibility for development to the Ontario H-E Commission while in the United States opinion is divided as to whether the responsibility should be a Federal one, or whether one of the major utilities should take over the work. New York State has already applied for authorisation to go ahead in conjunction with Ontario with the building of the power system, but the Federal Power Commission has declined to give a decision on the grounds that it lacked jurisdiction. An appeal has already been lodged with the Courts.

The cost of the Canadian project for the Seaway is estimated at about $650 million, and the time of completion is taken as about seven years. Savings on the Seaway would be about $45 million per year against a total annual charge on the system of about $16 million.

The necessary revenue would be raised by toll charges on the shipping. Some $30 million a year would be saved in transhipment charges alone. These savings give some idea of the losses that would be sustained by existing organisations and hence show the strength of the opposition to the scheme.

The Great Lakes system showing International Sections

overseas news

Queensland-N.S.W. Supplies

Plans for an interchange of electricity between Queensland and N.S.W. country towns were announced earlier this month by Mr. Riordan, Minister for Mines. He said 11 Queensland country towns would have auxiliary power plants operating before the end of the year. This scheme for the interchange of power between Queensland and N.S.W. was part of a plan for extending electricity supplies to west and south-west Queensland. The New South Wales North-West County Council would supply power to Texas, and Tenterfield would supply Wallangarra, he went on, and in return, Goondiwindi would supply power to Boggabilla. The supply would be connected to Isisford and Richmond in a few months, and Aramac, Muttaburra, Taroom, and Julia Creek would be supplied with electricity later in the year.

Lines Boosted

Two of the five transmission lines serving the Adelaide metropolitan area have had their operating voltage raised from 33 kV to 66 kV. In announcing this conversion of lines from the Osborne power station, Mr. K. H. Milne, assistant chief engineer of the Electricity Trust of South Australia, said it was probable another line would be converted to 66 kV working next year.

Another H.E.C. Station

The Otto Holden hydro-electric generating station (previously known as La Cave) of the Hydro-Electric Power Commission of Ontario, was officially inaugurated a few days ago, the ceremony being performed by Mr. V. Bilton, the Commission's chief concrete placing inspector. The station, the 13th opened since the H.E.C.'s expansion scheme started in 1945, is named after the assistant general manager of the Commission. It spans the Ottawa River at La Cave Rapids, with a dam about 2,500 ft long, 65 miles upstream from the Des Joachims plant. The dam, with a head of 81 ft, backs up the water into a lake 30 miles long and half a mile wide. Approval has been given by the Commission for the installation of plant with a total capacity of 256,000 h.p., but initially there are only two 32,000 h.p. sets operating. The remainder are scheduled for completion by early next year. The station is strategically located to serve both southern and northern Ontario, and the associated 230 kV transmission lines have been constructed.

Winnipeg's Good Year

Consumption of electricity on the City of Winnipeg Hydro-Electric System during 1951 amounted to approximately 760 million kWh—about 3·5% more than in the previous year. Of the total, nearly 355 million kWh were supplied as off-peak energy to electric boilers. The average consumption per domestic consumer again increased from 6,672 kWh in 1950 to 6,792 kWh last year—making another record. All load demands were met by the hydraulic plants. At the Amy Street station a new 15 MW steam turbine generator is being installed, and another 25 MW unit is scheduled for completion in 1953. Revenue increased by 4·1% to $5[illegible] millions, giving a net profit of $1,108,406 of which all but $406 has been transferred to the city general funds. In Winnipeg, where electric cooking and refrigeration have been adopted by almost everyone, where manufactured gas is available to few people, and where many homes have no chimneys, it is difficult for the population to understand why there is an excise tax and sales tax of 25% on cookers and refrigerators while on most of the home furnishings, including pianos, the tax is only 10%, it is stated in the Report.

Loan for Turkey

We learn that the International Bank for Reconstruction and Development has made a $25,200,000 loan to Turkey to help finance the Seyhan River project. This project, which aims at developing the Adana Plain, provides for the construction of a multi-purpose dam on the Seyhan River to be used for flood control, irrigation and the production of electricity. Total cost of the project is estimated at the equivalent of $35·8 million. The Bank's loan will be used to buy construction materials, equipment, generating and transmission plant, in the U.S. and Europe, and for the payment of engineering and contracting fees.

Austria's Export Power

Discussions have taken place in Washington between the vice-president of the International Bank and the Austrian chancellor, Dr. Figl, on the expansion of Austrian hydro-electric resources, it is reported. It is agreed that Austria has potentialities for the production of electricity which could be exported to neighbouring countries, but there is little hope that any such international project could be carried out without a major contribution by foreign capital. According to the reports, the International Bank would provide a loan in various foreign currencies other

than dollars. Countries that wished to purchase Austrian power could then participate in their own currencies in the financing of the various projects. The question of repayment would be greatly facilitated by a scheme of this nature. Direct negotiations on the loan could not begin, it is thought in Vienna, until certain preliminary questions—the extent of the Austrian capital contribution and a guarantee by the potential purchasing countries for given quantities of current over a long-term period—could be cleared up. The technical details of the projects for export power stations, such as for the Vorarlberg, Tyrol and East Tyrol, have already been formulated, but construction costs would be enormous.

Damodar Valley Progress

The first unit at the Bokaro power station of the Damodar Valley project is expected to come into operation before the end of this year, and the entire power station is likely to be completed by early next year, as originally scheduled, it is stated in the annual report of the Damodar Valley Corporation. The report adds that the World Bank, which has given a loan of $18·5 million to the Indian Government on account of the Bokaro-Konar transmission system of the Damodar Valley project, has expressed satisfaction at the rate of progress actually achieved. Installed capacity for the hydro-electric station at Konar has been raised from 10,000 kW as originally estimated to 40,000 kW, involving an extra cost of Rs. 35·3 million. The programme of construction for the coming year is stated to be: completion of the Bokaro steam station, Konar dam and hydro-electric station, Tilaiya dam and h.e. station, Maithon dam and h.e. station, Panchet Hill dam and h.e. station, transmission and distribution of power at high voltage, surveys and sub-soil exploration and rehabilitation of displaced families.

S.A.'s Needs

There is little hope of improvement in the delivery of power equipment needed for extensions by the Electricity Supply Commission of South Africa until the end of next year, according to Mr. E. V. Small, managing director of the British Thomson-Houston Export Co., Ltd., who is now visiting the Union. He pointed out that the shortage of electric plant was world wide, and the Union's power development schemes were held up by late deliveries no more than in any other country. The backlog of orders for generating plant, transformers and switchgear was being rapidly wiped out when the armament programme diverted much of their energies to defence, he stressed. Subsequently, Mr. Sauer, the S.A. Minister of Transport, warned British manufacturers that if they wanted to keep their markets in South Africa they must carry out promises of delivery of equipment.

Hex River Starts Up

Begun about three years ago, the first section of the new Hex River power station at Worcester, Cape Province, for the Electricity Supply Commission of South Africa, was brought into operation a few days ago when the first of three 20 MW generators was started up by Mr. H. H. Jagger, manager of the Cape Western system of the Commission. The new station will supply power to the Cape Western circuit, and will lessen the need for load shedding in the Peninsula and country districts which has been necessary of late. Two other generators of similar capacity are to be installed, and both are scheduled for operation by the end of this year. When fully operating, the station, the capital expenditure on which is estimated at £3,600,000, will supply most of the power required for the electrification of the railway line, already well in hand, from Bellville (a suburb of Cape Town) to Touws River, a distance of about 150 miles.

Small H.E. Station

The next few months will see the completion of a small hydro-electric scheme which was launched in August, 1951, by the Ceres Municipality, Cape Province. The station, constructed on the Skurweberge, is expected to be delivering 500 kW by October. The new dam forming a 90 million gallon lake, will not only operate the two 250 kW generators, but will also supply the town of Ceres with all the water she needs.

Conserving Coal

Following a suggestion by the Coal Allocation Committee, the city electrical engineer of Durban, Mr. C. Kinsman, has been asked to report on the possibilities of reducing electricity consumption to conserve coal. Mr. Cryan, chairman of the Trading Undertakings Committee, has pointed out that in Durban nearly all the householders depended on electricity for cooking and other domestic needs, so that while certain economies might be effected, he did not see how the peak consumption could be reduced very much. To cut down power could cause considerable embarrassment. In a multi-racial city like Durban it was essential to have the streets and the harbour well lit. The coal position at the Durban power station is satisfactory, it is stated.

Another Steam Plant

The New Zealand Government intends to construct a steam power station on North Island, with an installed capacity of 100 MW, it has now been officially announced in Wellington. North Island has been afflicted with power shortages for some time, and it is anticipated that certain restrictions will be necessary for a few years. The development of hydro-electric power is still to be given first priority, the statement adds. It will be recalled that there has been considerable local agitation for a decision on whether to build a new steam station or extend an existing one.

PERSONALITIES

IN THE INDUSTRY

Technical engineer to the London Division of the B.E.A., **Mr. J. Williams,** A.M.I.E.E., is retiring at the end of July, we understand. He is being succeeded, as from August 1, by **Mr. E. B. Powell,** M.INST.C.E., M.I. MECH.E., M.I.E.E., previously senior assistant engineer (development). Mr. Williams gained early training at the Trafford Park works of British Westinghouse, and was later testing engineer with Siemens Brothers. He joined the Yorkshire Electric Power Co. in 1912 and seven years later became technical engineer to the city electrical engineer of Salford. From 1929 to 1948 he served with the S. E. and E. England district of the C.E.B., being responsible for the commissioning of transformer stations and for metering, communications and development. His successor, Mr. Powell was originally trained as a mechanical engineer. After studying for three years at Loughborough Engineering College, he entered the Supply Industry as senior charge engineer with the St. James and Pall Mall Electric Light Co., being made assistant resident engineer in 1925. In 1928 he joined the engineering staff of the London Power Co., being engaged on system operation, and in 1945 became chief assistant operating engineer, and two years later, executive engineer (operation). Since the formation of the B.E.A. he has dealt with system development in the Technical Department of the London Division. In the past he has contributed a number of technical articles to the ELECTRICAL TIMES on transmission problems.

Mr. E. B. Powell

For many years a member of the Traction Division of Crompton Parkinson Ltd., at Chelmsford, **Mr. Frank W. Roberts,** B.SC., M.AMER.I.E.E., A.M.I.LOCO.E., will shortly be joining the staff of the company's Canadian agents, Bepco Canada Ltd. There, he will be technical liaison engineer between Bepco and the Gloucester Railway Carriage and Wagon Co. in connection with the supply and entry into service of 104 underground electric railway cars now being built for the Toronto Transportation Commission by the Gloucester Co. who have appointed Bepco as their sole Canadian representative for the contract. This $8 million order, provides for multiple unit trains with Crompton Parkinson motors and auxiliary equipment, B.T.H. control gear, etc., full details of which were given in our December 6, 1951 issue. It is expected that the cars will be put into service next year.

Mr. F. W. Roberts

Next week **Mr. C. Haydon-Brash** takes up an appointment with C. M. Churchouse Ltd., as a sales representative. As a sales engineer, he has been attached to the lighting section of Veritys Ltd. at the London depot, after previous experience with the Edison Swan Electric Co., Ltd.

Mr. G. A. Jackson has been appointed manager of the Spare Parts Division of E.M.I. Sales and Service Ltd., in succession to the late Mr. E. S. Rann. Mr. Jackson, who has been associated continuously with the radio industry since 1922, joined the Marconiphone service division in 1923. He transferred to the Special Products Dept. in 1930 and in 1936 took charge of the Marconiphone depot in Birmingham. During the war he was attached to the E.M.I. Service Division at Hayes.

Mr. G. A. Jackson

Mr. R. H. Price, formerly senior assistant engineer (electrical) Southern Group, in the Yorkshire Division of the B.E.A., has been appointed generation engineer (C), Southern Group in that Division.

Birmingham branch manager to Crompton Parkinson Ltd. since 1950, **Mr. C. J. Johnson** has been appointed sales supervisor (training) attached to the firm's head office in London. He joined the Maidstone branch as a representative in 1945, after 22 years with A. T. Moyle Ltd., automobile electrical and radio engineers, of Sussex, and in 1947 became assistant manager at the Manchester branch. Mr. Johnson's place at Birmingham will be taken by **Mr. C. Whittaker,** previously manager at the Cardiff branch, who has been with the company since 1938, first as a London salesman and later as assistant to the Manchester manager until his appointment at Cardiff in 1947. The new branch manager at Cardiff is **Mr. J. Watson,** who joined the firm in 1939 as a lighting engineer and took over the position of assistant branch manager at Manchester in 1947.

C. C. Wakefield and Co. Ltd. announce the appointment of **Mr. J. G. Bean,** formerly manager of their Stanlow installations, as chief production engineer for the entire Wakefield group of companies. **Mr. J. C. Cragg,** B.SC., F.INST.PET., becomes manager of Stanlow and **Mr. R. G. Pilsbury** assistant manager.

Mr. A. Kenneth Clyde, A.R.T.C., A.M.I.E.E., A.F.R.AE.S., has been appointed assistant chief engineer of Tiltman Langley Laboratories Ltd. He was educated at the Kelvinside Academy and the Royal Technical College, Glasgow, and was, from 1936 to 1938, a research engineer with C.A.V. Bosch at Acton. In 1938 he joined the Royal Aircraft Establishment, Farnborough, where he worked on aircraft electrical systems. From 1940 to 1945 he was in charge of a branch dealing with aircraft electrical installations at the Ministry of Aircraft Production and in 1945 he joined the Ministry of Supply Instrument Research and Development section where he was responsible for the design and development of aircraft electrical power supplies and utilisation.

The forthcoming retirement is announced of **Mr. A. C. Lewis,** who has been associated with the Aberdeen depot of the Marconi International Marine Communication Co. Ltd. since 1933. He will relinquish his duties at the end of August.

Mr. K. A. Spencer, B.SC.(Tech.), A.M.I.Chem.E., ASSOC.M.C.T., is proceeding to consulting corrosion engineering practice with special emphasis on coating materials and the application of cathodic protection. His addresses will be 5 Greencourt Rd., Petts Wood, Kent, and 40 South St., London W.1.

Mr. C. H. Chaplain, manager of the Publicity Department of the British Thomson-Houston Co., Ltd., has been elected Chairman of the B.E.A.M.A. Publicity Committee, and **Mr. V. J. Faulkner,** Publicity Manager to Crompton Parkinson Ltd., has been elected vice-chairman.

Out of 17 applicants for the position of city electrical engineer and general manager at Belfast, the sub-committee nominated by the Corporation Electricity Committee has recommended the appointment of **Mr. R. P. Watson,** B.A., B.A.I., M.I.E.E., who was promoted from sales engineer to his present post of deputy city electrical engineer five months ago, following the resignation of Mr. J. M'Candless. Mr. Watson has 29 years' service with the Corporation undertaking to his credit, having joined the department as a mains assistant. He subsequently became mains engineer, and, from 1939 to early 1952 was sales engineer responsible for the Installation and Sales Departments. If the recommendation is confirmed by the Council, Mr. Watson will succeed Mr. **W. J. McC. Girvan,** O.B.E., A.M.I.E.E., who has indicated his intention of retiring at the end of September.

Mr. R. P. Watson

The President of the Portuguese Republic has been pleased to confer the honour of Commander of the Order of Industrial Merit upon **Mr. I. T. Richards,** M.I.E.E., managing director of Automatica Electrica Portuguesa S.A.R.L., the manufacturing subsidiary company of Automatic Telephone & Electric Co. Ltd., in Portugal. Mr. Richards is also a director of Cabos Armados e Telefonicos, Lda., the Portuguese associate of British Insulated Callender's Cables Ltd.

Mr. I. T. Richards

Col. W. M. Lapper, formerly of the Yorkshire Electricity Board, is again working for the British Electricity Authority, this time in London, in the generation operation engineer's department, we understand.

Philips Electrical Ltd., announce that **Mr. W. F. Cassidy,** their Birmingham branch manager, has now been appointed regional manager for that area, which has been extended to include the territory covered by the Nottingham branch. **Mr. N. R. Law,** Nottingham branch manager, remains in his present position.

Friends of **Mr. Ronald Grierson,** M.I.E.E., M.I.Mech.E. (formerly of the Eastern Electricity Board), may like to note that he has now moved from Watford to 16 Sherington Avenue, Hatch End, Middlesex. Telephone Hatch End 735.

Power station superintendent at Barking power station for just over a year, **Mr. J. Harvey,** A.M.I.Mech.E., has been promoted to generation operation engineer, Group IV, to the London Division of the B.E.A., in succession to **Mr. J. G. Smith,** M.INST.F., whose impending retirement at the end of this month we noted last week. Mr. Harvey took over at Barking in May 1951, after being station superintendent at Woolwich for a year. He began his career with the P. and O. Steam Navigation Co. and later spent some time with the undertakings of the Gloucester and Kingston-upon-Hull Corporations before going to Fulham generating station where he was turbine house superintendent from vesting day till May 1950.

Mr. J. Harvey

Incidentally, it is regretted that last week we wrongly named as Mr. J. G. Smith the photograph of **Mr. L. A. Moir,** who has just taken up the position of London area manager of the Atlas Lighting Division of Thorn Electrical Industries, Ltd. We owe our apologies to both the gentlemen concerned. Mr. Moir, of course, has had extensive experience on the sales side with manufacturers, having been latterly home sales manager with Parnall (Yate), Ltd., and previously for 24 years with the Revo Electric Co.

Mr. L. A. Moir

At the June meeting of the Executive Council of the Association of Supervising Electrical Engineers, **Mr. L. L. Emmett** was unanimously elected National Chairman of the Association for the year 1952-53. **Mr. J. Flood,** Associate I.E.E., was elected vice-chairman and **Mr. E. J. Sutton,** M.I.E.E., was re-elected honorary treasurer. Messrs. D. Barke, J. H. McCarthy and W. Rowland were elected Trustees. Mr. L. L. Emmett started his career with British Insulated and Helsby Cables, Ltd., as an apprentice in their telephone works. After receiving technical training at the Liverpool Central Technical School he was on contract work with John Hunter and Co., Ltd., over a period of 29 years. In 1938, he took up an appointment with the General Infirmary at Leeds and is at present electrical engineer with the United Leeds Hospitals.

The retirement took place recently of **Mr. J. H. Peters,** who was formerly electrical engineer to the Connah's Quay Urban District Council, having joined that undertaking in 1925 as their first electrical engineer. In 1948 the Merseyside and North Wales Electricity Board took over the Connah's Quay system and Mr. Peters continued to serve the Board in an engineering capacity. To mark the occasion of his retirement, **Mr. R. N. Pegg,** the Sub-Area manager, presented Mr. Peters with a gold wristlet watch.

OBITUARY

Mr. J. A. Martin, for 23 years with E. K. Cole Ltd., latterly as representative for the West Lancs. area, has died, aged 62.

Mr. J. A. Thomson, J.P., chairman and managing director of Brown Brothers Ltd., died on June 20, aged 72.

Col. W. C. Devereux, C.B.E., managing director of Almin Ltd., died on June 21, aged 69.

I.E.E. AWARDS

It is announced that The Council of The Institution of Electrical Engineers has made the following award of Premiums for papers read or accepted for publicationduring the Session 1951/52.

GROUP A

Institution Premium to **D. P. Sayers,** B.SC., **J. S. Forrest,** M.A., D.SC., and **F. J. Lane,** O.B.E., M.SC.

Kelvin Premium to **A. L. Cullen,** PH.D., B.SC. (Eng.). *John Hopkinson Premium* to **T. H. Flowers,** M.B.E., B.SC.

GROUP B

Non-Section Premiums. Llewellyn B. Atkinson Premium to **H. L. Haslegrave,** M.A., PH.D., M.SC. (Eng.), WH.SC. *Extra Premiums* to **J. E. Flood,** B.SC.(ENG.), and **J. R. Tillman,** PH.D.; to **P. R. Howard,** B.SC.(ENG.).

Measurements Section Premiums: Silvanus Thompson Premium to **Professor F. C. Williams,** O.B.E., D.SC., D.PHIL., F.R.S., **T. Kilburn,** M.A., PH.D., **G. E. Thomas,** M.SC., and **A. A. Robinson,** M.A., PH.D. *Mather Premium* to **D. F. Lawden,** M.A. *Extra Premium* to **J. V. L. Parry,** M.SC.

Radio Section Premiums: Duddell Premium to **R. N. Bracewell,** B.SC., M.E., PH.D., **K. G. Budden,** M.A., PH.D., **J. A. Ratcliffe,** O.B.E., M.A., F.R.S., **T. W. Straker,** PH.D., and **K. Weekes,** M.A., PH.D. *Ambrose Fleming Premium* to **T. Kilvington,** B.SC.(ENG.), **F. J. M. Laver,** and **H. Stanesby.** *Extra Premiums* to **A. T. Starr,** M.A., PH.D., **T. H. Walker,** B.SC.TECH., **H. Grayson,** B.SC.TECH., **T. S. McLeod,** M.A., **R. A. G. Dunkley,** B.SC., **G. Dawson,** B.SC., **G. King,** B.SC., **L. Lewin, J. Lipinski,** and **J. B. Setchfield.** *Extra Premiums* to **G. H. Metson,** M.C., PH.D., M.SC., **S. Wagener,** DR.PHIL., **M. F. Holmes,** B.SC., and **M. R. Child; A. R. Boothroyd,** B.SC., **E. C. Cherry,** M.SC., **W. J. Bray,** M.SC.(ENG.), and **G. Millington,** M.A., B.SC.

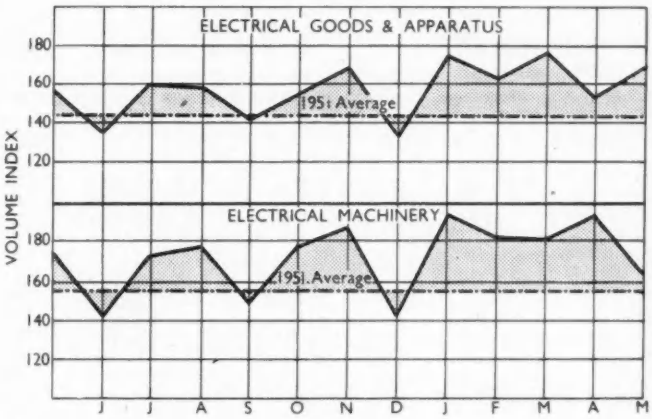
Supply Section Premiums: Sebastian de Ferranti Premium to **E. M. Johnson,** M.SC.TECH., and **C. P. Holder,** B.A. *John Snell Premium* to **H. von Bertele,** DR.ING., DIPL.ING., and **R. Tucker.** *Extra Premium* to **H. Chilton,** B.SC.

Utilisation Section Premiums: Crompton Premium to **J. C. Macfarlane,** O.B.E., WH.SC., **J. W. Macfarlane,** PH.D., WH.SC., and **W. I. Macfarlane,** B.SC., WH.SC. *Swan Premium* to **P. Bingley.** *Extra Premium* to **A. T. Robertson.**

GROUP C

Fahie Premium to **J. Bell,** M.SC., **J. Â. B. Davidson,** M.A., and **E. T. A. Phillips.** *Heaviside Premium* to **P. M. Woodward,** B.A., and **I. L. Davies,** M.A. *Webber Premium* to **R. H. J. Cary.** *Oversea Premium for Senior Members* to **G. Fuchs,** DIPL.ING. *Willans Premium* to **A. R. Cooper,** *Students' Premiums* to **G. Campbell,** B.SC.(ENG.); **D. B. Johnston,** B.SC.(ENG.), and **D. J. Kingsbury,** B.SC.; **G. P. Cundall,** B.SC.; **A. S. Denholm,** B.SC.; **P. A. L. Ham** and **M. J. Beer; D. J. Harris,** B.SC. (ENG.), and **R. J. Ryan,** B.SC.(ENG.); **J. T. Machowicz,** B.SC.; **N. G. Meadows; P. N. Prior,** B.SC.(ENG.). and **A. J. Walsh.**

EXPORTS AND IMPORTS



EXPORT VOLUME INDEX

April export results were to some extent reversed during May, when electrical machinery exports decreased sharply, and those of electrical goods and apparatus rose. In the first category there was a fall to 164% of the 1947 volume of exports, after allowing for changes in prices that have occurred since that date. The total value of exports in the electrical machinery class was £4,766,943.

Exports of electrical goods and apparatus returned to near their highest level with a total value of £10,217,027. After allowing for the previously mentioned price changes, this is 164% of the 1947 average volume.

LAST month's exports of electrical goods, at £15,639,200 was only £433,811 in value less than the record so far established—for the month of March last—despite the incidence of import restrictions. It will be seen that goods in Class F, many of which come under recent restrictions, actually increased in value compared with April. In last month's figure for electric cooking and heating appliances, flat irons alone amounted to £81,012. Of the fans too, desk and ceiling models, amounted to £130,923. But complete electric washing machines exported in May totalled £471,878 in value (compared with £459,663 in April and £761,042 in March). Also in addition to our table complete portable electric tools valued at £113,713 were sent abroad in the month.

Description	Exports Value Month of May			Imports Value Month of May		
	1950	1951	1952	1950	1951	1952
	£	£	£	£	£	£
Telegraph and Telephone Wires and Cables—						
Submarine	66,307	12,711	56,467	—	—	—
Other	626,248	556,098	963,895	—	—	—
Rubber Insulated	286,036	538,880	801,757	—	—	—
Insulated, other than Rubber	875,089	1,019,841	1,368,244	—	—	—
Wireless Apparatus, including Valves	1,238,280	2,124,999	2,092,792	182,793	272,787	329,834
Telephone and Telegraph Apparatus	1,420,250	1,137,776	1,528,260	—	—	—
Electric Lighting Appliances, Accessories, Fittings and Parts:—						
Filament Lamp Bulbs	93,010	146,154	126,642	15,781	17,850	5,944
Other Descriptions	294,905	361,082	459,565	28,093	51,017	36,746
Batteries (primary)	99,059	249,823	286,480	—	—	—
Accumulators, Portable	210,957	366,475	354,226	—	—	—
,, Stationary	131,634	51,292	81,053	—	—	—
,, Parts and Accessories	59,047	56,614	74,032	—	—	—
Electrical Cooking and Heating Appliances	218,535	458,279	511,937	—	—	—
Ammeters, Voltmeters, etc., and Parts	88,043	134,036	132,289			
House Service Meters	109,897	106,573	169,404	35,292	47,051	53,821
All Other Instruments	132,498	186,458	132,836			
Electro-Medical Apparatus	39,895	60,077	40,842	—	—	—
X-Ray Apparatus, etc.	65,068	123,041	134,754	15,924	31,879	40,276
Insulating Materials	172,839	224,184	190,255	—	—	—
All Other Articles	448,789	569,503	711,301	125,773	107,643	181,310
TOTAL OF GROUP	6,706,386	8,483,946	10,217,027	403,656	528,227	647,931
Electrical Machinery:—						
Generating Sets (Diesel)* Not exceeding 200 kW	835,041	415,694	465,246			
,, ,, ,, Exceeding 200 kW	141,007	342,278	209,421			
Other Generating Sets	207,959	860,771	106,501	42,099	73,942	53,978
Generators minus Prime Movers, and Parts†	202,143	341,525	483,634			
Motors	612,182	873,793	915,421	34,044	35,020	48,546
Convertors, Transformers, Rectifiers, Motor Control Gear, Switchgear, other machinery	1,770,341	2,125,597	2,586,720	13,845	27,928	27,250
Fans, Electrically and Power Driven	117,501	177,680	198,074	—	—	—
Vacuum Cleaners or Electrically Operated Appliances	298,656	517,390	457,156	—	—	—
TOTAL APPLIANCES AND MACHINERY	10,891,216	14,138,674	15,639,200	493,644	665,117	777,705

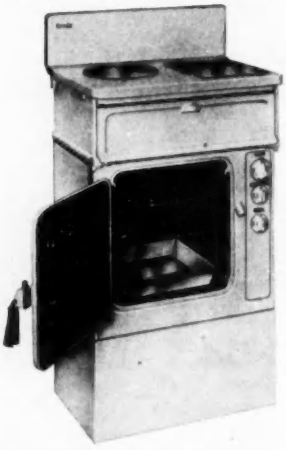
* 1950 Figures include generators minus prime movers. † 1950 Figures for parts of generators only.

The BUYER'S *Column*

Creda's New R 306

NEWLY designed Model R306 is the Creda answer to the problems raised by increased cost of raw materials, say SIMPLEX ELECTRIC CO. LTD., Broadwell, Oldbury, Birmingham.

This model is well made and contains efficient equipment. It is finished in two-tone ivory vitreous enamel, complete with "Credastat" oven control and "Simmerstat" controlled 8-in. boiling plate and grill boiler, yet its list price is only £25 11s. 6d.



The Creda R 306 is Simplex Electric's answer to the problems presented by increased prices

It embodies all well-known Creda qualities of robust construction and trouble-free performance for years of service.

Dimensions are as follows: height, 35 in.; width, 22¼ in.; depth, 16 in.; height of splash plate above surface of hob, 6 in. The oven is 13 in. by 13 in. by 12 in. deep, whilst grill chamber is also roomy, 21 in. wide by 12 in. by 4 in.

Designed for standard voltages, a.c. 200/210 V, 220 V, 230/240 V, 250 V, and also 110 V a.c., the R 306 is available with plinth or legs at no extra cost. Its weight on legs of 161 lb is increased by 8 lb when used with plinth.

The R306 is even more inexpensive when finished in silver-grey vitreous enamel: it costs only £22 13s. 10d.

Price Increase

AS a result of further increases in the price of copper, BRITISH DRIVER-HARRIS CO. LTD. Gaythorn Mill, Albion Street, Manchester, 15, have found it necessary to increase the metal surcharge of their nickel-copper (advance) to 1s. 9d. per lb.

As from Monday, June 30, this increased surcharge will apply on all advance material invoiced.

New Colour for Ekco Car Radio

IN response to many requests, E. K. COLE LTD., Ekco Works, Southend-on-Sea, Essex, are now to produce their model CR117B car radio (complete receiver without speaker unit) in beige as well as black. The new version will be identified as CR117/2/B. The price of the CR117/1/B (black) and CR117/2/B is £30, including tax. The price of the CR117 (which includes the speaker unit) is 30 gns. including tax.

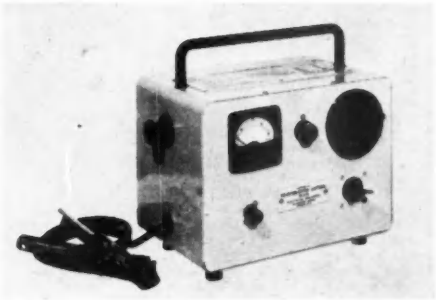
Testing Portable Tools for Safety

A LARGE percentage of the accidents reported in the Government publication on electrical accidents were attributed to the use of power tools which, not being properly earthed, or the earthing arrangements being faulty, had proved a source of danger to the operator.

Entirely suitable for testing power tools is the "full-load earth continuity tester," marketed by BRITISH CENTRAL ELECTRICAL CO. LTD., 6 and 8 Rosebery Avenue, London E.C.1, which has now been completely redesigned.

Our illustration shows the new model which is soon going into production. The method of operation is simple. First the set is connected to the mains supply (a.c., 50 c/s), and the lead of the power tool connected to the socket on the face of the test set. A steel grip is clamped on to the earthed metal part of the portable tool or instrument. When the push-button is depressed a current of approximately 15 amp is passed through the earth connection. If there is single-strand continuity in the conductor, this will then be fused and open circuited. Should the current not fuse the earth conductor, then by means of a graph on the instruction plate at the top of the instrument, combined with meter readings, it is possible to determine the resistance per length of the conductor, its condition, etc.

B.C.E.'s earth continuity tester has a new look



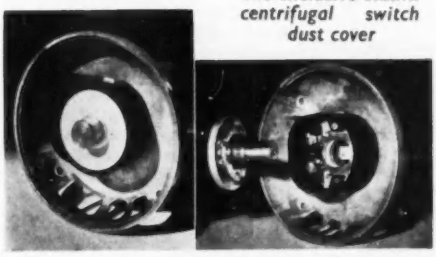
Refinements in the new version of the tester include a "New Look" exterior, increased output to 20 amp, the inclusion of a handle and a fault indicator pilot light, and the property of being operated horizontally, vertically or on its back.

List price of the new tester will be £25.

The S.E.M. Centrifugal Switch Dust Cover

EXCLUSIVE to the S.E.M. range is a centrifugal switch dust cover for single-phase a.c. motors, which has been produced by SMALL ELECTRIC MOTORS LTD., Eagle Works, Churchfields Road, Beckenham, Kent.

It has been developed by the company's engineers as a protection device for the centrifugal switch on motors which must operate in heavily dust-laden atmospheres, particularly in woodworking machinery, paint-spraying compressors, and coal stokers. By enclosing the switch, the risk of motor breakdown through clogging of the switch mechanism and duty contacts is greatly minimised.



The exclusive S.E.M. centrifugal switch dust cover

It can be fitted as an extra to ¾-h.p., 1- and 1½-h.p. motors (1,420 r.p.m. and 2,800 r.p.m.).

An Automatic Bi-fuel System for Engines

THE application of the Allday Automatic Bi-fuel system to petrol engine generator sets will no doubt prove of great value in effecting economies of operation.

This system, manufactured by BOATS AND ENGINES, 30 Queens Road, Weybridge, Surrey, makes for easy starting, smooth and silent running, all virtues of the petrol engine, yet permits these virtues to be obtainable in addition to the economies of operation on vaporising oil as a fuel.

It is claimed that there is no loss of power on changeover or change in engine revolutions affecting the voltage of supply from the generation. The risk of oil dilution and lack of throttle flexibility are obviated.

Uncertain changeover from one fuel to the other, especially when the engine is idling, is eliminated inasmuch as the control of the fuel used is determined automatically by the temperature of the vaporiser.

TRADE PUBLICATIONS

STREET LIGHTING EQUIPMENT.—The General Electric Co., Magnet House, Kingsway, W.C.2, have published the fourth edition of Z(1), their catalogue of street lighting equipment. It contains photographs, diagrams and specifications of main and side road lanterns, non-standard and decorative lanterns, and lantern brackets.

PHOTO CELLS.—A recent publication of the Communication and Industrial Valve Department of Mullard Ltd., Century House, Shaftesbury Avenue, London W.C.2, describes operating principles and responses of their photo cells and includes characteristics and general operational recommendations of several types.

ACCESSORIES.—The 1952 catalogue issued by M.K. Electric Ltd., Wakefield Street, Edmonton, N.18, is now available. All previous lists are cancelled, but the only price alterations (of 5%) are in respect of the 13-amp socket-outlets, List Nos. 727, 730 and 732.

METAL FINISHING.—Tenth issue (June) of the "Bonderizer" monthly news sheet issued by the Pyrene Co. Ltd., Metal Finishing Division, Great West Road, Brentford, Middlesex, contains an article on the Hoover washing machine.

GENERATING PLANT.—The English Electric Co. Ltd., Queens House, Kingsway, W.C.2, have issued a brochure giving full details of all steam turbine plant installed throughout the world since 1920 until the present year.

CIRCUIT-BREAKERS.—New publication, "Air-blast Circuit-breakers, Frame 'G'," which has been issued by English Electric Co. Ltd., Queen's House, Kingsway, gives details of the technical features of this equipment.

VALVES AND TUBES.—A valuable source of reference on Mullard valves and tubes for industry and communications is the new publication issued by the Communication and Industrial Valve Department of Mullard Ltd., Century House, Shaftesbury Avenue, London W.C.2.

ENGINEERING SPARES.—A list of redundant stocks of spare parts, both for electrical and general engineering applications, has now been issued by Chamberlain Industries Ltd., Staffa Works, Leyton, London E.10.

SIGNALLING EQUIPMENT.—New publication No. EB2310, issued by The Automatic Telephone and Electric Co. Ltd., Strowger Works, Liverpool 7, deals with signalling for underground man-riding haulage systems.

CATERING EQUIPMENT.—New specification sheet featuring Creda grillers, Models HC.2822/3/4, has now been issued by Simplex Electric Co. Ltd., Broadwell, Oldbury, Birmingham.

The WEEK in NEWS

Ministry Explains New Copper Price

Working Party to consider Resumption of Free Dealings

AS promised in its announcement concerning the increase of £50 in the price of copper, the Ministry of Materials had issued a statement on the make-up of its new selling price. The new price of £281 per ton charged to U.K. consumers includes £5 a ton to make up for losses incurred during the fortnight when the selling price was below the buying price. The new price of £264 per ton to be paid to producers will replace the old arrangement, whereby the Ministry based its price on the New York export quotation. As a result of negotiations to fix an alternative basis of pricing, the new level of £264 per ton agreed with Rhodesian and Canadian suppliers will enable the current price (£281) to be maintained. Those suppliers will receive an extra £44 a ton in future. The increase is substantial but would have been considerably higher, but for the co-operation of the producers.

It is hoped that the copper market will settle down in the near future and that steady trading will be resumed.

Apart from the loss of £5 per ton already referred to, the Ministry states that other charges borne by them, such as freight, refining, interest on capital employed, and delivery to works, have also increased, and the margin for this purpose has been raised by £1.

It has also been announced that a working party is to be set up to study the conditions in which free dealings in copper could be restored. This is merely a preliminary move so that time will not be wasted at any future date. There is no possibility that a free market will be restored yet awhile, because apart from balance of payments considerations, the Government is bound by an inherited contract under which Rhodesian producers are entitled to six months' notice of any decision to end bulk buying operations. A similar working party has already reported on the possibility of a resumption of free dealings in lead.

Licence Not Needed to Import Electricity

"ELECTRIC currents" is one of the items on the latest Danish import licensing regulations, which may be freely imported from any country without licence. The explanation is that Denmark is getting a power supply from Sweden via the undersea cable. Other items in the list are: mica, and metal filaments for incandescent lamp manufacture. The Danish authorities are also prepared to issue, from specified countries, including Britain, licences for the free importation of certain goods, such as transformers of 1,200 kVA and over, and turbines over 4,000 kW. Among goods which may be imported from named countries (including Britain) are hearing aids and special electro-medical apparatus, such as X-ray plant.

STEADY MARKET IN PORTUGUESE EAST AFRICA

ONE of the most important development schemes in hand in Portuguese East Africa at present is the River Movene dam to provide power for Lourenco Marques and to irrigate the surrounding area. Taking preference over the scheme, according to the latest Overseas Economic Survey, just published, is the Limpopo irrigation scheme, and in consequence the River Movene development will not begin for some years. In view of the fact that all machinery is imported the prospects for British manufacturers in the project are good.

Electrical goods required range from small domestic appliances and fittings, through accumulators and motors to hydro-electric machinery. Existing activities of both an industrial and housing nature provide a useful market for numerous electrical goods, while, on a long-term basis the hydro and urbanisation schemes being planned will eventually create a large demand for heavy and light equipment. The U.K. has an established market—her most prominent exports at present being accumulators and amplifiers, radio electric and telephonic equipment, lamps and generators.

The First Half-Century

The Automobile Club's second trial of electric vehicles has been postponed to the six days beginning July 21. The trials are tests of the trustworthiness of all parts of electrical carriages but not of the life of accumulators. The Committee is of opinion that a trial of six days is entirely inadequate for ascertaining the life of an accumulator. There are to be hill-climbing trials; in these speed will be an important factor. An average speed will be fixed for every type of car, and marks will be deducted for speeds below the normal. Marks will be deducted for all stops other than compulsory stops, and marks will be deducted for every mile of the course which may be unfinished at the end of the day.—*From our issue of June* 26, 1902.

S.I.M.A.'s FOURTH ELECTRONICS SYMPOSIUM

THE fourth symposium and exhibition organised by the Electrical and Electronics Section of the Scientific Instrument Manufacturers' Association will take place at the Exhibition Hall, Queen Sq., W.C.1, between September 2 and 5. As in previous years, a series of technical papers (numbering six in all this year) will be read by specialist scientists and engineers, and there will be the usual comprehensive display of the latest British scientific and electronic instruments.

Among the papers to be read will be "Electronics in Strain Measurement" by Mr. D. L. Johnston, "Electronic Instruments Developed by E.R.A. for Research in the Electrical Industry" by Mr. G. Mole, Mr. J. R. Boundy's "Electronic Measurement and Control for Industry," and Mr. D. K. Das Gupta's "Electronics in Temperature Control." Entrance will be by ticket, which may be obtained from the Association's secretary at 20 Queen Anne St., London W.1.

CONCEALED LIGHTING IN SCOTTISH CHURCH

ONE of the ideals sought after by illumination engineers in the design of new installations is the total concealment of fittings while achieving the maximum amount of light. A recently completed scheme where this ideal was all but achieved in its entirety was at the Larbert parish church in Stirlingshire.

Rectangular trough reflectors each housing two 100 W or 150 W G.L.S. lamps were used with the addition of diffusing glass screens. They have been mounted above the cross members of the roof so that they remain unseen by the congregation. Added advantage is the effect of spaciousness as hanging fittings have become unnecessary. Fittings were supplied by Metropolitan-Vickers Electrical Co. Ltd. Contractors were David Reid and Co. (Electrical Engineeers) Ltd.

Instruments for Industrial Physics

ELECTRONIC instruments are prominent among the exhibits being shown this week at the Fourth Industrial Physics Conference. The conference, which is organised by the Institute of Physics, is meeting at the Royal Technical College, Glasgow, and has as its theme "physics in the transport, shipbuilding and engineering industries."

In the exhibition the instruments shown span the research and application fields, and the latest products of a large number of electrical firms are shown. Amongst items of special interest presented by Government and co-operative research organisations are the B.E.A.'s ultrasonic crack detector, developed for the inspection of riveted boiler drums. This is an application which, it may be remembered, attracted special mention by American power supply engineers touring this country. There is also a fault duration recorder which notes the time and duration of faults on each phase and the neutral of a system.

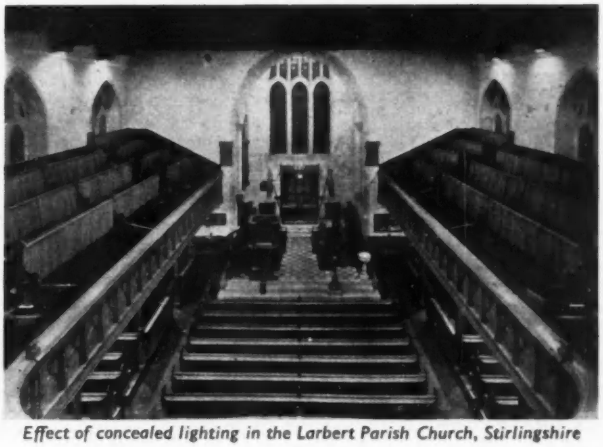
D.S.I.R. includes in its display a range of laboratory produced scales which illustrate the influence of vanadium on heat-resisting alloys, a matter of great importance in connection with gas turbine design, while from B.I.S.R.A. comes a magnetic steel-plate thickness meter and a control circuit for use in steel strip rolling. This latter device makes use of resistance strain gauges to measure the mill roll force.

A dewpoint meter working on the surface conductivity of glass is presented by B.C.U.R.A., and the E.R.A. is well represented by a dielectric dispersion meter, used for testing insulation for the presence of water, by a working model of a heat pump, and the association's low voltage a.c. argon arc welding surge injector unit.

Detailed information on the exhibits is given in a descriptive catalogue which is obtainable from the Institute of Physics, 47 Belgrave Square, S.W.1, price 1s.

"Golden Anniversary"

COMMEMORATING the 50th Anniversary of the Paterson Engineering Company, a reception was held by Sir William Paterson, founder and chairman, and Lady Paterson early this week, at the Hall of the Worshipful Society of Apothecaries. Principal speakers were Lord Waverly and Alexander Grey, who outlined the story of their early friendship with Sir William Paterson. It was at this time Sir William founded the company which has played an important part in water-purification.



Effect of concealed lighting in the Larbert Parish Church, Stirlingshire

RE-ORGANISATION OF R.G.D. Co. AT BRIDGNORTH

AS previously announced in our issue of August 9 last, the Radio Gramophone Development Co., Ltd., has become a wholly-owned subsidiary of Automatic Telephone and Electric Co., Ltd., in order to meet the increasing requirements of our defence programme. A further statement issued last week reveals that the company proposes to continue operations at the existing factory at Bridgnorth (Shropshire) and as from June 18 business will be conducted under the new name of Automatic Telephone and Electric (Bridgnorth) Ltd., formerly known as Radio Gramophone Development Co., Ltd.

As from the same date those assets of the Radio Gramophone Development Co., which comprise the manufacture and sale of radios, radiograms and TV receivers at Bridgnorth, including patents and trade marks, have been assigned to Mr. W. Harries, on behalf of a new company under the same name, with offices at 3 Hampton Court Parade, East Molesey, Surrey. This new company has acquired all stocks, including service spare stocks, and has taken over service arrangements which will continue to operate from 27 St. Mary's Street, Bridgnorth.

OFFICIAL PUBLICATIONS

BRITISH STANDARD

B.S.1443: *Sizes of X-ray film and intensifying screens.*

29TH ANNUAL REPORT ON SAFETY IN MINES RESEARCH, 1950. H.M.S.O., price 2s.

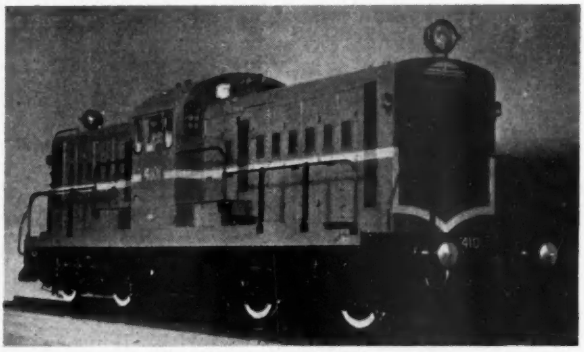
POST-WAR BUILDING STUDIES. *No. 30: on Lighting of Office Buildings* (*see page* 1165). H.M.S.O., 3s. 6d.

B.E.A.M.A. GLOSSARY OF TECHNICAL TERMS AS USED IN INDUSTRIAL H.F. HEATING. B.E.A.M.A., price 2s.

PENSIONS (INCREASE) H.M.S.O., 6d. *Bill before House of Commons.*

OVERSEAS ECONOMIC SURVEY. H.M.S.O. 3s. 6d. *Portuguese East Africa* (*see page* 1182).

HIRE PURCHASE AND CREDIT SALE. *Agreements* (*Control*) (*Amendment No.* 2) *Order*, 1952. H.M.S.O., 2d.



The above is a scale model of one of ten 1,000 h.p. diesel-electric switching and shunting locomotives being made in this country for N.S.W. Government Railways. Main contractors are the British Thomson-Houston Co., who are supplying the main and auxiliary generators, motors and control equipment. Maximum speed will be 57 m.p.h., and total weight of each will be 72 tons. Diesel engines are being supplied by Davey, Paxman and Co., and mechanical parts by Metropolitan-Cammell Carriage and Wagon Co. Driving cab is in the centre and has duplicate control position for either running direction

Civil Engineers find Electricity Useful

ELECTRICITY spreads its tentacles throughout the entire field of engineering and nowhere was this more clearly demonstrated than at the exhibition held in conjunction with the Conversazione at the Institution of Civil Engineers. Apart from the more obvious example of electric motive power as in the Rapier W.1400 walking dragline, of which a working model was exhibited, electrical influence was to be found in about one-third of the exhibits.

Electrical accessories, now firmly established, justify their place in engineering by the ease with which they can measure and record rapid changes. Two examples sufficed to indicate this usefulness. In the measurement of strain, gauges have been adapted to operate in conjunction with an oscillator, changes in strain causing variation in frequency which could be detected audially or recorded by photographic means. Geophysical studies also use electrical methods to record photographically the impulses reflected from substrata of an explosion at ground level. These records form the basis from which the depth and character of rock below the surface may be deduced.

An easily portable power source was demonstrated in the electrically operated mechanical sieving equipment for use in field experiments to analyse soil size distribution. Revolving eccentric weights provided a rocking motion in two planes which, imparted to a tier of sieves mounted on a suspended platform, enabled analyses in eight minutes, a considerable advance on manual methods.

Coal Price Structure

THE price of coal has such an important bearing on the electricity charges that the Federation of British Industries' latest publication entitled "Coal Price Structure" may well provide the supply industry with some interesting reading. The F.B.I. has received numerous enquiries from members regarding the structure of coal prices which have changed considerably during post-war years. Accordingly this 12-page pamphlet has been compiled to give a full and detailed explanation of the considerations on which those changes have been based.

STAMPS TO HELP SETTLE ACCOUNTS

AS foreshadowed in our April 10 issue (page 693), the North Western Electricity Board is introducing its system of selling stamps to consumers in an effort to prevent the large quarterly bill for electricity. The stamps will be valued at 2s. 6d., and customers will be able to buy them and submit them on cards in settlement, or part settlement, of their accounts. They will be available from 13 of the Board's service centres in the Lake District.

The scheme is being tried out over an experimental period of six months, and, if successful, will probably be introduced in other parts of the Area.

IS A SCULLERY A ROOM?

PROTESTS are being delivered to the local M.P. and to the North Western Electricity Board by Urmston residents following the receipt of their first electricity bills under the recently introduced standard tariff. Many maintain they are being overcharged under the system of basing charges on the number of rooms in the house. Protests are mainly concerned with the assessment of a scullery as a room. Householders are saying that a house cannot have two kitchens, and a scullery should not be classed as a room if it is added on to a kitchen.

Electricity at Agricultural Shows

At Kelso

EARLY fears that the Royal Highland (Agricultural) Show at Kelso last week would not be as successful as in previous years due to the enforced absence of cattle and sheep, were quickly dispelled, and the show turned out to be at least the equal of its predecessors. It was too, an entirely satisfactory show from the electrical industry's point of view, where "shown for the first time in Scotland" seemed to apply to most exhibits. The S.E. Scotland Electricity Board, in conjunction with E.D.A., had a large stand and made the important decision of showing one example of a particular machine instead of the past practice of including several types of the same piece of equipment. This enabled much more to be exhibited and more space for viewers to move around. Literature of other makes was prominently displayed.

The stand was arranged in sections. One of the latest exhibits in the dairy section was an in-churn milker, taking milk directly to the churn. This was on show for the first time, as also was an improved model of a chilled water milk cooler which might be of particular value as it uses the same water over and over again. Storage steam raisers are not new, but one on show aroused farmers' interest because of its low kilowatt loading—tariffs being based on the loading. There was also a new oat crusher, fully automatic, which can be left unattended and which switches itself off. An electrically heated cattle rug, electric hoists, grain elevators, food mixers, grooming equipment and shearing machines are examples of other items shown. Mention must also be made of the "animal coaxer"—a simple instrument like a torch, with two prongs. A touch on the animal's rump and it gets a mild sensation which in turn produces the necessary movement in the animal. Those items listed here were but a few of the almost embarrassingly large selection displayed.

At Guildford

THE Royal Counties (Agricultural) Show returned to Guildford last week for the first time since 1932. As at Kelso, electricity received due prominence and the South Eastern Electricity Board put on a brave display in which crop drying was probably the main feature. There was a full-scale working model of a platform grain dryer and a section for demonstrating the pre-heating of tomato beds. There were 14 sections in Seeboard's exhibition altogether, covering almost all applications of electricity on the farm, whether they be horticultural, dairy, or merely domestic appliances for the farmhouse.

Shortage of Gas Pipes: Electricity may be Used

WE hear that there is some consternation in Sunderland over the current acute shortage of cast-iron gas pipes caused by the equally acute shortage of steel. As a result the town council is considering the installation of electricity instead of gas in many of its new houses. Representations are being made on the matter, but we understand the council has been informed that it is a national and not a local shortage.

Seeboard's stand at the Royal Counties Show, Guildford

A good example of operation by remote control is shown in this photograph of an engineer handling a radio-controlled crane. His work can be seen by means of the Marconi television camera only. This demonstration took place during the recent Mechanical Handling Exhibition

Heenan and Froude Entertain

AN admirable opportunity was afforded guests of Heenan and Froude, Ltd., recently to view their Worcester works and the factory of its subsidiary company, Fielding and Platt Ltd., in Gloucester. The parent company was formed in 1880, and ever since has enjoyed continued progress and expansion both at home and in the export market. In the latter field during the current financial year, direct and indirect exports amount to about 30% of total production, after deductng special rearmament business. The contracts in hand at present include numerous test plants for various purposes and organisations, special electric dynamometers and water, air and hydrogen coolers.

Although acquired by Heenan and Froude as recently as 1939, Fielding and Platt's history goes back to 1866, when small workshops were opened in St. Luke's St., Gloucester. Export sales being in most people's minds nowadays, we note that since the war, equipment valued at £2 million has been exported. Export orders in hand are valued at £500,000, the majority destined for Commonwealth countries.

Birlec Celebrate Silver Jubilee

JUNE 20 was a day to be remembered at Birlec Ltd.'s works in Tyburn Road, Birmingham, for on that date the company celebrated its silver jubilee. To celebrate the occasion a number of events were arranged for the entertainment of employees and friends last week.

First, there was the Sports Day on June 14. Then on the Tuesday the Board entertained to dinner 40 employees with over 20 years' service, at Stratford-on-Avon. On June 20, a hundred friends, customers and suppliers attended the jubilee dinner, and the following day 1,400 Birlec employees and friends travelled on a day's outing to Blackpool.

A corner of Ramsgate's Festival of Light. Early visitors to the resort have expressed their appreciation of the illuminations, in some cases avowing that they are superior to Blackpool. Most of the lamps used were supplied by B.T.H. and some by Edison Swan. Design and production were by Franco-British Electrical Co., Ltd.

NEWS IN BRIEF

H.M. the Queen has been pleased to grant her patronage to the Royal Commercial Travellers' Schools. Successive Royal patronage has now continued without exception for 97 years.

Many new records were set up by competitors at the Eastern Electricity Board's Northmet sub-area Sports Day, held recently.

Over a thousand employees of Oldham and Son, Ltd. went to Blackpool recently for their annual outing. There was nothing to pay and in addition each person received 15s. pocket money.

An order for wireless equipment has been placed with Marconi's Wireless Telegraph Co., Ltd., by the Kingdom of Yemen. The installation, which includes a 100 W Oceanspan transmitter and two all-frequency receivers, is expected to be completed in late autumn.

European Military Communication Co-ordination Committee of N.A.T.O. visited the Greenwich works of Telcon recently.

Engineering Rural Supplies

With reference to the article under the above heading which appeared last week, we have been asked to make it clear that the middle photograph of Fig. 1 is a simple and economic construction which is being compared with the more complicated fabricated cross-arms seen in the other two photographs of that figure. The published caption did not make this clear.

Questions in Parliament . . .

Lighting and Road Safety

Replying to the debate on road safety in the Commons on Friday, Mr. G. Braithwaite commented at some length on the subject of street lighting. He referred first to zebra crossings and announced that they will be lit. The orange globe would be illuminated so as to become a blinking beacon or flashing light to warn approaching motorists.

As regards street lighting in general, Mr. Braithwaite said it would be unrealistic to demand that all built-up roads should have Group A standard lighting. Modern types of lighting using sodium and mercury vapour, and later fluorescent types, represented a great advance in efficiency, he said. The wartime period of shortage and restriction which necessitated economy in the installation of new street-lighting schemes had now ended, but it was still necessary to keep a tight hold on the disposition of resources, and only limited capital resources could be made available. A limited amount of work only could be permitted each year.

Mr. Braithwaite said, despite criticism, there was little doubt of the efficiency of sodium and mercury lamps. Lighting authorities were being persuaded not to install expensive fluorescent systems where others would serve. Generally speaking, fluorescent lighting should be reserved for central and shopping areas where it is not only required for traffic but also as an amenity.

Certificates and Diplomas

Mr. J. Johnson asked on Thursday whether the award of certificates and diplomas to students completing courses of university standard at technical colleges would be considered in technologies where no degrees existed. The Minister of Education said it was customary for technical colleges to award their own certificates and diplomas in cases where degrees were not available. National diplomas were available in some technologies. She added that it was not proposed to establish a college of technology with power to grant awards, but she would consider representations for further action if needed.

Complaints against Croydon B

Reference was made in the House last week to complaints by residents near Croydon B power station to the effect that considerable quantities of grit and filth were being emitted. The Minister of Fuel and Power stated that he had not received any complaints but he understood the B.E.A. had had a number since last December. The station was equipped with the most up-to-date plant for preventing the emission of grit from chimneys, but, the Authority reported, it was possible that some of it was not working properly. Investigations were instituted immediately and were continuing.

Copper Supplies

In a written answer last week, Mr. Duncan Sandys stated it would not be practicable to discontinue price control licensing and distribution of copper. It was still subject to international allocation and, despite the questioner's remarks, supplies of copper to this country were still insufficient to meet current requirements.

American Steel and Coal

Two questions were asked last week concerning imports of steel and coal from America. In view of the threatened curtailment of U.S. steel supplies, Mr. Edelman asked what action the Minister of Supply was taking in the matter. The Minister said that constant touch was being maintained with the U.S. Administration and it had been pointed out that any interruption in supplies would have serious effects particularly on the execution of our defence programme.

As regards coal, the Minister of Fuel and Power stated none was being imported from America. He had been asked if such imports could cease in view of the reduced demand in textile centres and other trades not fully employed.

Smoke Eliminator Doors

Mr. Woodburn asked whether action was being taken to see that the smoke eliminator doors designed at the Fuel Research Station were put into general use. Mr. G. Lloyd replied saying that the doors had received a deal of publicity but responsibility for their use rested with industry itself.

Volta River Project

Asked concerning the Volta River project in the Gold Coast, the Secretary for Overseas Trade said the Government were greatly interested in the potentialities of the scheme but participation in the Volta River project would involve heavy capital commitments and it was important that it should be thoroughly examined before commitments were undertaken. Further exploratory talks had just been concluded, he said. Satisfactory progress was made in the most important technical and financial questions, but certain points had still to be examined.

Wenvoe TV Station

Asked what area would be covered by the new TV station at Wenvoe, Mr. D. Gammans said the service area would be approximately along a line through Barnstaple, Tiverton, Teignmouth, Swanage, Marlborough and Gloucester, and slightly to the north of Brecon, Carmarthen and Tenby. Some of the country included was mountainous and reception would vary from district to district. It was not yet known, he said, when the high-powered station would be functioning, but in other cases of low power stations going to high power, it took about three months.

Electric Supply News . . .

Bath

A proposal by the South Western Electricity Board to use three overhead lines to supply three sites in the city, to which the Corporation object on a matter of principle, was the subject of a public inquiry last week. Mr. R. Hiles, deputy town clerk, told the Ministry inspector, Mr. H. W. Grimmett, the City Council considered that the city was unique and that it should be treated as a spa city, where amenities must be preserved for the sake of the whole country. Because of this, they felt it was worth the additional expense of laying cable underground. The three proposed sites are: from Locksbrook Road to cottages on the Island at Weston; to the caravan site at Quarry Farm, Claverton; and to a private enterprise housing estate at Bradford Road, near Fox Hill Lane. Mr. Gerald Marsh, estate agent to the Board, maintained that not all of Bath had architectural beauty, and the cost of putting lines underground was not justified in these three cases. The inspector later examined the three sites and the Ministry decision will be announced later.

Douglas (I.O.M.)

The Electricity Committee has approved a plan submitted by the borough electrical engineer for mains extensions covering Scheme III on the Willaston estate, and has been authorised to carry out the work at an estimated cost of £11,000.

E. Midlands

During March and April the East Midlands Electricity Board sold on credit terms in Nottinghamshire and Derbyshire 167 cookers, 43 wash boilers, 220 washing machines, 55 immersion heaters, 329 vacuum cleaners and 19 refrigerators. Cookers and wash boilers let out on hire showed net increases of 60 and 181 during the two months. These figures have been presented to the Area Consultative Council.

Eire

The Electricity Supply Board is now seeking tenders for the civil construction work of the hydro-electric development on the River Lee. In this there are to be two power stations: one at Inniscarra, about nine miles from Cork, where one 15,000 kW turbo alternator and one 4,000 kW set will be installed; and the other at Carrigadrohid, about ten miles upstream from Inniscarra, where the station will have one 8,000 kW unit. Cost of the scheme is estimated at £2,650,000.

John o' Groats

Next Monday, June 30, the North of Scotland Hydro-Electric Board's overhead distribution section from Wick to John o' Groats (distance 17 miles) will be officially inaugurated at a special switching-on ceremony at John o' Groats which will be attended by Mr. Thomas Johnston, chairman of the Board.

N. Ireland

In the future development of rural electrification in Northern Ireland there would probably be a selective policy of schemes which were not only remunerative but of direct benefit to farm production, Mr. M'Cleery, Minister of Commerce, told the Ulster House of Commons last week. He was replying to a debate on a motion which "expressed concern at the present slow rate of rural electrification and urged the Government to introduce legislation to permit the Electricity Board for Northern Ireland to implement the former system of guarantees which was in operation before the 1948 Electricity (Supply) Act (N. Ireland)." The motion was withdrawn. Mr. M'Cleery said that it was the larger farms which had, proportionately, taken the greater advantage of the facilities provided by farm electrification. In the three years to December 31 last, the Board had more than doubled the number of farms supplied. Since January last, about 400 farms had been connected, and while the Board's rate of progress had been retarded, it was expected that by the end of 1952 the figure would be 800, making a grand total of 6,056 farms supplied. He was not surprised that the removal of the guarantee had not been an unqualified success. A system of free connections could not succeed unless every consumer used the service to the fullest possible extent. The Board had represented to him from time to time that the revenue from consumers connected since the abolition of the guarantee fell far short of an economic level. Just over one-third of farms supplied were using electricity for farm purposes. Promising a further statement in the autumn, Mr. M'Cleery said his Ministry would consult with the Ministry of Finance and the Board, in the meantime.

To back up the statement, the Electricity Board provided members with a copy of a chart, in which the extent of electricity supplies to farms were given as: farms with lighting only, 1,139 (20·8% of total), lighting and heating, 1,246 (22·7%), lighting, heating and cooking, 1,110 (20·2%), domestic supplies, 3,495 (63·7%), lighting in outbuildings, 2,246 (41%), and domestic and other purposes, 1,987 (36·3%).

LIGHTING SCHEMES

Colne Valley.—The U.D.C. is pressing for the electrification of street lighting from West Slaithwaite to Marsden on the Manchester Road. The scheme was approved some time ago, but is awaiting M.o.T. sanction.

Darlington.—T.C. has obtained loan sanction for £1,210 for providing street lighting at Haughton South housing estate.

Dorchester.—T.C. applying for consent to borrow £1,583 for the conversion of 71 lamps to electricity, and installation of 10 others.

Company Activities . . .

Aberdare Electric Co.

The profit for the year to March 31 last, after charging all expenses and depreciation is £40,161 (*£24,371*). To directors' fees £1,500 (*nil*), taxation £17,000 (*£11,044*), new issue expenses £726 (*nil*), off preliminary expenses £1,000 (*nil*), and after payment of the 8% dividend, there is £17,913 (*£8,714*) carried forward. In his review, Mr. C. O. Stanley, chairman, states that the company has agreed to sponsor a larger new undertaking for the manufacture of steel wire, etc. This project will, it is anticipated, require at least £200,000, and negotiations regarding finance are now proceeding.

Ada (Halifax) Ltd.

For the year to April 30 last, the consolidated trading profit of this manufacturer of washing machines and machine tools is £175,668 compared with £217,281 for the previous period. The dividend, however, is increased from 10% to 15%. Taxation absorbs £105,194 (*£127,345*) and after all other charges, including £11,812 (*nil*) written off preliminary expenses, there is £5,510 (*£1,712*) carried forward.

Allen West & Co.

The issue to stockholders of 780,000 new Ordinary 5s. shares at 8s. each has been heavily oversubscribed, it is announced.

Anglo-Portuguese Telephone Co.

The rights issue of 850,000 £1 Ordinary shares at 20s. 6d. each was undersubscribed, it is stated. Underwriters have been called upon to take up 55.8% of the shares.

Broadcast Relay Service

The group trading profit for the year to March 31 last is £1,611,747 compared with £1,341,126 for the previous year. After charging depreciation, directors' fees, audit fee, taxation, etc., the net profit is £541,837 (*£528,903*), of which £149,689 (*£181,394*) relates to minority interests. The final Ordinary dividend is again 8% tax free, making 16% tax free, and there is £377,241 (*£374,400*) carried forward.

East African Power and Light Co.

Documents were sent to shareholders this week in connection with the issue of 1,737,777 Ordinary shares of 20/- each at a price of 22/6d. per share. The issue is being made by way of rights to Preference and Ordinary shareholders in the proportion of one for every three held.

General Electric Co.

Treasury consent has been received to a scrip bonus issue of one new share for every £1 of Ordinary stock held. The issue will capitalise £5,877,720 of the share premium reserve. The new shares will not participate in the final dividend for the year ended March 31 last.

W. T. Henley's Telegraph Works Co.

Approximately 2,875,000 of the 3,250,000 new Ordinary shares, offered at 14s 6d. per share, were taken up and the balance has been absorbed by applications for excess shares, it is announced.

Keith Blackman Ltd.

Profit for the year ended March 31 last is £322,272 (*£238,170*), before providing £200,000 (*£125,000*) for taxation. The dividend is 25% (22½%). To general reserve £75,000 (*£20,000*), pensions reserve £15,000 (*same*), provisions for deferred repairs nil (*£6,000*) and there is £77,464 (*£90,342*) carried forward.

Mirrlees Watson

The Ordinary dividend is increased by 2½% to 15% for the year ended March 31 last. The balance available is £138,240 (*£109,955*), the general reserve gets £70,000 (*£50,000*), and there is £26,815 (*£25,043*) carried forward.

Telegraph Construction & Maint. Co.

A meeting is to be held on July 8, to consider a proposal to increase the capital from £1,500,000 to £3,000,000 by the creation of 1,500,000 additional shares of £1. Of the undivided profits, £325,682 is to be capitalised and applied in paying up 325,682 Ordinary shares £1 each, distributed in the proportion of one for three held. A further 651,364 £1 shares will be issued at 21s. 6d. each.

Herbert Terry & Sons

The net profit for 1951 is £143,038 (*£96,330*) including profit on realisation of investment of £17,115 (*nil*), and after taxation of £175,751 (*£124,599*). The final Ordinary dividend is 10% and bonus 2½%, making 17½% for the year (*same*). £24,520 (*nil*) is transferred to investments reserve, and £85,000 (*£65,000*) to general reserve.

Ultra Electric (Holdings)

Group net credit for the year to March 31 last is £130,385 (*£101,591*) after charging taxation of £32,000, and providing £20,000 for contingencies. After a lapse of three years the company is making a dividend of 10%, which absorbs £16,406. Appropriations to reserve total £38,000, and the debit balance of £46,701 brought in is converted to a credit balance of £29,278 to be carried forward.

Dividends Declared

Allied Ironfounders, Ltd.—Final dividend of 10% (*11¼%*) making 17½% (*same*).

International Combustion, Ltd.—Interim of 10% (7½%). But this is not to be taken as an indication of an increased total for the year. Last year's total was 25%.

Marco Refrigerators, Ltd.—The directors have decided not to pay an interim Ordinary dividend in respect of the year ending September 30 next. But Mr. A. E. Leach, chairman, states that no interpretation should be placed upon this relative to the possibility of a final payment.

Commercial Information

CONTRACTS OPEN

HOME

June 27.—Morpeth T.C. Electric lighting and power supply in 422 gas-lit council houses. Borough Surveyor, 36 Bridge St. Deposit £2 2s.

June 27.—Norton R.D.C. Electrical work in houses at Burythorpe and Kennythorpe, near Malton. R. W. Clayton, Architect to Council, Welham Road.

June 28.—Burghead. Electrical work in extensions to Moray Sea School. Applications by above date to Rowland Anderson, Kininmouth and Paul, 107 High St., Forres.

June 30.—Ballymena. Wiring in conversions at Waveney Hospital for N. Ireland Hospitals Authority. Secretary is M. Park, Waveney Hospital, Ballymena. Deposit £3 3s.

June 30.—Belfast. Electric lighting and heating installations in Downey House school, Pirrie Park. A. W. Gordon Holt, consulting engineer, 74 South Parade. Deposit £3 3s.

June 30.—Elgin T.C. Installation of street lighting in Admiralty housing scheme in Lossiemouth Rd., and in fifth and sixth developments at Seafield Lands. G. N. Blane, burgh surveyor, Weston House.

June 30.—Kinlochleven. Electrical work in erection of St. Paul's Episcopal Church. Alexander Ross and Son, architects, 28 Queensgate, Inverness.

June 30.—Stockport T.C. Rewiring, lighting and electrical installation at Town Hall. Wm. F. Gardner, Borough Surveyor, Town Hall. Deposit £5 5s. (See May 29 issue.)

July 3.—Birmingham. Installation of electric lifts in 7-storey flats at Shard End. City Engineer and Surveyor, Civic Centre. Deposit £2 2s.

July 3.—Glasgow. Electrical and heating installation, including lift, at Alexandria Hospital for Western Regional Hospital Board, 64 West Regent St., Glasgow C.2. Names to Board's secretary by above date.

July 5.—Chislehurst and Sidcup U.D.C. Provision and erection of 27 concrete columns and lanterns with auxiliary equipment for London-Maidstone Rd. Engineer and Surveyor, W. B. Farrow, Council Offices, Main Rd., Sidcup. Deposit £2 2s.

July 7.—Ashbourne U.D.C. Supply and erection of 28 140 W sodium lamps, and 70 150 W tungsten all complete with standards for street lighting. Engineer and Surveyor, King Edward St. Deposit £1 1s. (See June 5 issue.)

July 7.—Dublin. Electrical installation at Dublin Regional Sanatorium, Blanchardstown. P. D. Cinneide, Dept. of Health, Custom House, Deposit £20.

July 7.—Leeds. Supply, erection and maintenance of an electrically driven centrifugal pump with capacity of 1,400 galls. p.m. General Manager and Engineer, Waterworks Dept., Civic Hall.

July 7.—Galway (Eire). Complete electrical installation at Country Clinic, Shantalla. J. A. Kenney and Partners, consulting engineers, 44 Kildare St., Dublin.

July 8.—Oldbury T.C. Provision and erection of 59 concrete columns with lanterns fitted with glass refractors and Perspex bowls and 100 W filament lamps and time switches. Borough Surveyor, Municipal Bank Chambers. Deposit £2 2s.

July 9.—Sale T.C. Wiring for lighting and power in 32 houses being built on Oaklea Farm estate. Borough Engineer, Town Hall. Deposit £2 2s.

July 10.—Aberdeen. Electrical work in alterations and additions to Ellon Academy. E. L. Williamson, architect, 14 Golden Sq., Aberdeen.

July 12.—Prescot U.D.C. Supply, erection and commissioning of sodium vapour discharge lighting units on Liverpool-Warrington trunk road, A.57. Distance is about 2,886 yds. Council Offices, Prescot. Deposit £2 2s. (See this issue.)

July 14.—Selkirk T.C. Supply, erection of mercury street lighting along about 1,135 yd. of Edinburgh-Carlisle trunk road within burgh, to Group "A" standard, comprising 31 units. W. Y. Carmichael, town clerk, Municipal Buildings.

July 16.—Gloucester. Supply and installation of two electrically driven well pumps at Newent station. Pumps to be driven by shafts from vertical motors on surface. J. H. Goodridge, City Surveyor and Water Engineer, 21 Eastgate St. Deposit £2 2s. (See May 29 issue.)

July 18.—Londonderry. Electrical installation at Portstewart primary school extension. F. W. Parkinson and Partners, consulting engineers, 6 Murray St., Belfast. Deposit £3 3s.

July 19.—Manchester. Electrical installation to main hall and outbuildings, Superintendent's House, and drive lighting at Oakwood Hall, Romiley. City Architect, Town Hall. Deposit £1 1s. (See June 19 issue.)

July 31.—Cheshire. Names of contractors for electrical installation work required by County Council for list of contractors and suppliers. Application forms should be returned to E. Mainwaring Parkes, County Architect, The Castle, Chester, by above date.

Aug. 1.—Belfast. Supply and erection of (*a*) three-phase l.v. high rupturing capacity switchgear, and (*b*) carbon dioxide fire extinguishing equipments for substations. Electricity Dept., E. Bridge St. Deposit £2 2s., (See June 19 issue.)

No date stated.—Bridlington. Electrical work at Bempton Lane Hospital for Scarborough, Bridlington, etc., Group Hospital Management Committee. Documents from L. Hartley, group secretary, Scarborough Hospital, Scarborough.

OVERSEAS

*Details of items marked * may be obtained on application to the Board of Trade, Horse Guards Avenue, S.W.1, quoting reference.*

July 3.—Australia. Tenders invited by Director of Posts and Telegraphs, Melbourne, for supply of electrical equipment, power oscillators and signal generators. They may be lodged with Chief Supply Officer, Room 406, Australia House, Strand, London, W.C.2. B.o.T. (Ref. CRE 21680/52).*

July 11.—Formosa. Tenders invited for supply of 76,750 yd of rubber-covered wire for outdoor use. Central Trust of China, 68 Yen Ping Rd., S. Taipei, Taiwan. B.o.T. (Ref.: CRE 21453/52).* Same concern also requires 7,960 yd of double rubber covered wire and copper wire. B.o.T. (Ref.: CRE 21034/52).*

July 15.—Iraq. Supply of eight 1½-ton electrical air conditioning sealed units, two 2-ton units and one ½-ton unit for Directorate of Civil Medical Stores, Bagdad. B.o.T. (Ref. CRE 21620/52).*

July 16.—India. Supply of conductors and accessories to various specifications. Directorate General of Supplies and Disposals, Shahjahan Rd., New Delhi. B.o.T. (Ref.: CRE 20322/52).*

July 17.—South Africa. Supply of mouthpieces, telephones and similar materials for S. African Railways Stores Dept., P.O. Box 7784, Johannesburg. B.o.T. (Ref. CRE 22025/52).*

July 21.—New Zealand. Post and Telegraphs Dept., Wellington, invites tenders for supply of 575 condensers to various specifications. B.o.T. (Ref. CRE 22042/52).*

Aug. 4.—Pakistan. Supply of four turbo-alternators of 1,000 kW each, two automatic discharge gates, two sets of power station switchgear, 11 kV, step-up transformers and other ancillary equipment. Documents available (£1 10s.) from Office of High Commissioner, 34 Lowndes Sq., London S.W.1.

Aug. 11.—South Africa. Municipality of Nelspruit invites tenders for supply and erection of 11 kV power line, transformer and switches. (Contract NSI/1952.) Documents from consulting engineer, J. S. Clinton, Preston House, Simmonds St. South, Johannesburg. Deposit £3 3s.

Aug. 19.—South Africa. City Council of Pretoria invites tenders for supply of some 69,000 ft. of 33 kV cable with associated equipment. Town Clerk, P.O. Box 440, Pretoria. B.o.T. (Ref.: CRE 20568/52).*

Aug. 19.—Uruguay. Supply of substation transformers for 30/6 kV network of town of Paysandu comprising two step-down transformer stations from 30 kV to 6 kV of 7,500 kVA or 3-phase 50 c/s for interior installation. Usinas Electricas y Telefonos del Estado, Paraguay 2431, Montevideo. B.o.T. (Ref.: CRE 21588/52).*

Aug. 28.—Australia. Manufacture, erection and year's maintenance of six 3-phase or 18 single-phase oil immersed current limiting reactors with normal continuous rating of 255 A at 33 kV. General Manager, Sydney C.C., Queen Victoria Building, George St., Sydney.

Sept. 1.—Portuguese W. Africa. Municipality of Nova Lisboa invites tenders for supply of armoured cables and for supply and installation of equipment for transformer stations. Secretaria da Camara Municipal, Pacos do Concelho, Nova Lisboa. B.o.T. (Ref.: CRE 20709/52).*

Sept. 3.—Australia. Manufacture, supply and erection of two banks (13 and 14) of l.t. switchgear for Howard power station. State Electricity Commission of Queensland, Scottish Union House, Eagle St., Brisbane. B.o.T. (Ref. CRE 21990/52).*

Oct.—New Zealand. State H.-E. Dept. invites tenders for supply of five sets of equipment as follows: (i) 100 MVA 11 kV switchgear of single busbar, metal-clad, indoor drawout type for Arapuni power station, closing date Oct. 7; (ii) 150 MVA 11 kV switchgear of duplicate busbar indoor, metal-clad drawout type for Thames substation, closing date Oct. 14; (iii) 250 MVA 11 kV switchgear of duplicate busbar indoor, metal-clad, drawout type for Huntley 110 kV substation, closing date Oct. 21; (iv) 10,000 kVA 110/33 kV transformer bank and spare unit for Palmerston substation, closing date Oct. 14; (v) same as (iv) for Milton substation, closing date Oct. 21. Plans can be seen at N.Z. Govt. Offices in London and elsewhere.

CONTRACTS PLACED

Glasgow. Provision of negative boosters for Whitevale substation, General Electric Co. Ltd., £8,970.

Harrogate T.C. Supply of cables and connections to street lamps. N.E. Electricity Board, £1,175.

Norwich. Electrical work at central library, Secker and Sons (Norwich) Ltd., £1,010.

South Shields T.C. Supply of trolley wire, British Insulated Callenders Cables, Ltd., and Thomas Bolton, Ltd.

Wisbech. Electrical work in alterations at North Cambridgeshire Hospital, Ely Electrical Co., Ltd., £1,377.

Your Queries — Answered

"Tex" trafficators, makers of? E.S.—Magnatex Ltd., Harlington Works, Bath Rd., Harlington, Middx. (23231)

Bunghole inspection lamps for barrels, makers of? M.A.—General Electric Co. Ltd., Magnet House, Kingsway, W.C.2; Watts Fincham (1932) Ltd., 9 St. Helens Place, E.C.3; Reliance Electric Wire Co. Ltd., Staffa Rd., E.10. (23238)

Spark-gap type high-frequency heating equipment, makers of? L.B.—Birlec Ltd., Sunderland House, Curzon St., W.1. (23236)

"Neoflec" testers, makers of? G.D.—Grafton Kerston and Co. Ltd., 77 South Audley St., W.1. (23241)

"Britex" irons, suppliers of? W.P.—British Home Stores Ltd., 129 Marylebone Rd., N.W.1. (23247)

"Apex" washing machines, address for spares? J.H.—Home Electric Washer Co. Ltd., 1 Craven Park, N.W.10; Apex Electrical Engineering Co., 116/118 Camp Rd., Leeds 7. (23254)

"Beta" fires, makers of? D.H.—British Emulsifiers Ltd., Edison Rd., N.8. (23260)

"Lyndon" dies, makers of? W.W.—Tom Carrington and Co. Ltd., Lyndon Tool Works, Stony Lane, West Bromwich. (23271)

The above are selected from questions we have answered this week. If you have a query, send it to us.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

Albert Arrowsmith Ltd., 21 Ford St., Salford, 3, Lancs. Manufacturers of bakery utensils, hardware, hollow-ware, cookery, heating and lighting apparatus, etc. Cap.: £2,000. Dirs.: A. Arrowsmith and Mrs. D. M. Arrowsmith.

Brooke Industries Ltd. Kent House, Telegraph St., E.C.2. To acquire goodwill and business of "J. A. Brooke and Co.," electricians, engineers, garage proprietors, draughtsmen, patentees, inventors of and manufacturers of and dealers in electric fans, accumulators, etc. Cap.: £20,000. Dirs.: to be appointed by subs. Subs.: D. W. Kneller and B. K. Bonser.

Cables and Flexibles Ltd., 1 Thornhill Cres., N.1. Manufacturers and factors of and dealers in electrical cables, electrical and other wire, insulators and insulating materials, etc. Cap.: £1,000. Dirs.: W. E. Spriggs and E. C. Spriggs.

Casella (Electronics) Ltd., 24 Coleman St., E.C.2. Manufacturers of and dealers in electronic and mechanical testing instruments, etc. Cap.: £4,000. Dirs.: R. P. Abraham, E. W. Meyer, A. S. Greenwood and D. A. Herbert.

Cheston Engineering Ltd., 39 Church Ave., East Sheen, S.W. 14. General heating, ventilating, lighting, mechanical and electrical engineers, etc. Cap.: £2,000. Permt. dirs.: Margaret Cheston Jones and W. H. Price and C. T. A. Jones.

PRICES OF CABLE METALS AND OTHER MATERIALS
(at Wednesday morning)

	£ s. d.	New York price
COPPER, electrolytic	281 0 0	284 0 0
LEAD, good soft pig (foreign)	137 0 0	124 0 0
,, ,, ,, "English" quality ...	138 10 0	
Tin (99·99·76%) ... ...(Cash)	972-974	—
,, (3 months)	970½-971½	—
ALUMINIUM, commercial purity (del.)	154 0 0	—
ZINC	130 0 0	120 0 0
ARMOURING:		
Galv. Steel Wire (0.104 in.) ...	55 10 0	—
Mild Steel Tape (0.04 in.)	39 15 0	—

TRADE NOTES

Zinc Price. As from June 20, the U.K. price of good ordinary brand zinc was reduced by £8 to £130 per ton. The Ministry of Supply has also made an order freeing secondary zinc, zinc alloys, zinc scrap, and bunmetal scrap from price control. This order also increases the prices of secondary copper, brass, copper scrap, gilding metal scrap, brass scrap, and cupro-nickel scrap.

Lead. From June 24, the price of lead was increased by £4 to £133 a ton delivered, and from June 25 a further £4 to £137 a ton.

Beama Contract Price Adjustment Formulae.—*For Electrical Machinery and Equipment.*—For purposes of calculating variations in: (a) "Rates of Pay"—the rate of pay for adult male labour at June 14, 1952, shall be deemed to be 134s.; (b) "Cost of Material"—the index figure for materials used in the electrical machinery industry published in the Board of Trade Journal on June 14, 1952, is 165·5.

For Turbo-Generating and Allied Plant.—For purposes of calculating variations in: (a) "Rates of Pay"—the rate of pay for adult male labour at June 14, 1952, shall be deemed to be 134s.; (b) "Cost of Material"—the index figures published in the Board of Trade Journal on June 14, 1952, are: Material used in mechanical engineering industries 151·7, "Blast Furnaces and Iron and Steel Melting and Rolling (40 and 41)" 142·6. The price of brass condenser tubes ¾ in. o/d, 18 s.w.g. published in The Metal Bulletin on June 13, 1952, is 3s. 5¾d.

For Outstanding Contracts covered by the B.o.T. Intermediate Products Index.—For purposes of calculating variations in: (a) "Rates of Pay"—the rate of pay for adult male labour at June 14, 1952, shall be deemed to be 134s.; (b) "Cost of Material"—the index figure for intermediate products published in the Board of Trade Journal of June 14, 1952, is 366·9.

Changes of Address. The Radio Communication and Electronic Engineering Association has moved to larger premises at 11 Green St., London W.1. Telephone Mayfair 7874.

The Spurvic Manufacturing Co., Ltd., has moved to new factory premises at Glastonbury, Somerset, where they are continuing the production of generating sets, pumps, etc.

As from June 30, the London branch stores of British Insulated Callender's Cables Ltd. is moving from Nine Elms Lane to 10-14 White Lion St., Islington N.1. Telephone: Terminus 8696.

Egypt's Imports. Among goods for which applications for sterling imports into Egypt must now be submitted to the Egyptian Exchange Controller are domestic electric appliances, including refrigerators, and telegraphic and telephonic apparatus.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

"Cadet." 706,645. Class 11. Electric fans for ventilation. London Fan and Motor Co., Ltd., 91a Burghley Rd., Tufnell Park, N.W.5.

Redivox. 705,233. Class 9. Instruments and apparatus and parts for the production, transmission, reception, amplification, detection, distribution etc. of sound, light or electric waves. Central Rediffusion Services Ltd., Carlton House, Lower Regent St., S.W.1.

Stenovox. 664,889. Class 9. Sound recording, and talking machines. Brecomin (England) Ltd., Salisbury House, London Wall, E.C.2.

Vertiveyor. 706,505. Class 7. Elevators, conveyors, stacking machines and loading and piling apparatus. J. Collis and Sons Ltd., 42/43 Regent Sq., W.C.1.

Vitrathene. 706,044. Class 9. Insulated electric cables and wires. **Vitrathene.** 706,045. Class 17. and **Vitrone.** 706,046. Class 17. Non-mouldable plastics for use in manufactures; and insulation materials and parts, insulators, pipes and tubes, etc. A. Lockhart Ltd., trading also as Stanley Smith and Co., 77 Worple Rd., Isleworth, Middx.

BUSINESS PROSPECTS

Airdrie T.C. Plans approved for erection of 166 houses on Craigneuk site.

Antrim. Erection of intermediate schools at Whitehead, Lisburn and Finaghy has been approved.

Axminster R.D.C. It is proposed to build 72 dwellings at Beer.

Aylesbury R.D.C. Erection of 50 houses at Aston Clinton. Architect is R. C. White, 4 Temple Square.

Bishop's Stortford U.D.C. 140 houses to be built on Havers Lane estate.

Burton-on-Trent T.C. Tenders will probably be invited soon for erection of £53,000 primary school in Eldon St. and 32 flats in Balfour and Craven Sts.

Bury St. Edmunds T.C. Tenders to be invited soon for erection of 24 houses at Reeve Close.

Chelmsford T.C. Tenders to be invited shortly for erection of 34 houses on Melbourne estate.

Chelmsford R.D.C. Proposal to erect 72 houses and 8 bungalows at Gt. Waltham has been approved.

Clacton. Building of additional accommodation at St. Osyth's training college is estimated to cost £40,000.

Cork. It is proposed to build regional and maternity hospitals at Wilton at estimated cost of £1,700,000.

Edinburgh. Dean of Guild Court has approved erection of 36 houses in Northfield Farm Ave. for James Miller and Partners Ltd.

Felling (Dur.) U.D.C. It is proposed to build 320 houses in Sunderland Rd. Tenders to be obtained for erection of 60 houses near Fisherwell Rd.

Gateshead and District Management Committee is considering additions costing £250,000 to Queen Elizabeth and Sheriff Hill Hospitals.

Greenock T.C. Approval granted for erection of 146 houses in Cottonmill Row and High St.

Halifax T.C. Re-electrification of Queen's Rd. county primary school is estimated to cost £1,245.

Huntingdon. Plans in hand for extension of factory in St. Germain St. for Oriental Confectionery Co., Ltd.

Kidderminster T.C. R. Colley are planning factory extensions at Prospect Hill.

Kirkintilloch T.C. Dean of Guild Court has approved plans for erection of 36 houses at Bothlyn Park.

Londonderry. It is proposed to construct additional accommodation at Rainey school, Magherafelt, at cost of £130,000.

Mansfield Woodhouse (Notts.) U.D.C. Construction of 42 houses on Cox Lane estate. Surveyor, W. W. F. Shuker, Council Offices, Manor House.

Melford (Suff.) R.D.C. Erection of 32 houses at Bures St. Mary and Gt. Waldingfield. Architects, H. C. Hughes and P. Bicknell, 1 Tunwell's Court, Trumpington St., Cambridge.

Middlesbrough T.C. Plans approved for a £9,000 library at Thorntree.

Monmouthshire. Erection of county primary school at Langstone, nr. Newport. Colin L. Jones, county architect, Queen's Hill, Newport.

Morpeth T.C. 66 houses to be built on site No. 4 in Spelvit Lane. Borough Engineer is F. K. Perkins.

Northumberland. Secondary school to be built at Valley Gardens, Whitley Bay. C. C. Brown, county architect, County Hall, Newcastle.

Newtownards (Down). Northern Housing Trust is to build 478 houses on various sites.

Oldham T.C. Construction of second stage of secondary school at Hathershaw. Documents from Messrs. F. Thorpe and Whyman.

Oxford. Negotiations in hand with John Laing and Son Ltd., Mill Hill, London, for erection of 36 houses and 60 flats on Wood Farm estate.

Penrith U.D.C. Tenders to be invited shortly for erection of 24 houses.

Peterborough. Erection of 116 houses on Dogsthorpe North estate. City Engineer's Office, Town Hall.

Poole T.C. Tenders to be invited for erection of 48 flats on Bourne estate.

Portadown T.C. Erection of three blocks of flats comprising 46 dwellings and 6 shops on Killycomaine estate. G. Stuart Alderson, borough architect, Tavanagh House.

Portland (Dorset) U.D.C. It is proposed to erect 134 houses on second stage of Verne Common estate, and to extend Pound Piece estate by erection of 200-300 houses in the future.

Rochford (Essex) R.D.C. Construction of 32 dwellings at Rochford Garden Way. Engineer and Surveyor, Council Offices.

South Shields. Cairns and Byles, "The Cedars," Osborne Rd., Newcastle, have been appointed electrical consultants for Marine and Technical College.

South Shields T.C. Construction of 174 houses on section 5 of Simonside estate. Borough Engineer, John Reid, Town Hall.

Spennymoor (Dur.) U.D.C. Plans approved for erection of about 550 houses on Middlestone Moor estate.

Stamford (Lincs.) T.C. Negotiations in hand with Morton Potter Ltd., for erection of further 52 houses on Drift Rd. estate.

Stockport T.C. Harry S. Fairhurst and Son, architects, 55 Brown St., Manchester, to prepare bills of quantities and invite tenders for erection of 48 flats and a shop near Covent Garden.

Strood (Kent) R.D.C. Fifty houses to be built at Cliffe for Anglo-Iranian Oil Co.

Stratford-on-Avon T.C. Tenders expected to be invited shortly for erection of 48 flats on both Redlands estate and in Lodge Road.

Swadlincote (Derby) U.D.C. Erection of 50 houses on Hartshorn estate. Engineer and Surveyor, Bank House, Midland Road.

Swansea. It is hoped to build College of Further Education at Pontardawe. Also, plans in hand for erection of 126 houses and 48 flats to complete West Cross estate.

Tynemouth T.C. Plans approved for 120 flats and 60 houses at Chirton Grange.

Walsall T.C. Erection of 94 houses on Field Rd. estate. M. E. Habershon, borough engineer and surveyor, Council House.

Westhoughton U.D.C. Erection of 36 houses on Hindley's estate. F. H. Walker, Engineer and Surveyor, Town Hall.

West Ham T.C. Construction of 34 houses in Ashburton Road. T. E. North, Borough Architect and Planning Officer, 70 West Ham Lane, E.15.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

British Astral Co. Ltd. Meetings of members and creditors will be held at Edward Thomas Collins and Son, 28 Baldwin St., Bristol, on July 22 at 11 a.m. and 11.15 a.m. respectively, to receive liquidator's report.

Camden Components Ltd. Resolution for voluntary winding-up passed at meeting on June 9.

Cumbrian Electrical Co., Ltd. Meeting of creditors will take place at Midland Bank Chambers, Penrith, on July 4 at 2.30 p.m.

Electrical Engineering and Advice Bureau Ltd., electrical contractors. Last day for receiving proofs in respect of intended dividends, July 5. Liquidator is H. P. Naunton, Official Receiver, Inveresk House, 246 Strand, W.C.2.

Isle of Thanet Electric Supply Co. Ltd. Meeting of members will take place at Winchester Hse, Old Broad St., London, on July 18 at 12 noon to receive liquidator's report.

Rolamatic Ltd. Meeting of members will be held at 3-4 Clements Inn, London W.C.2, on Aug. 15 at 2.15 p.m. to receive liquidator's report.

L. Telling and Co., Ltd., electricians of Bugle, Cornwall. First and final dividends of 9s. 5¾d. in £ payable tomorrow (Fri.) at 4 Tregarne Terrace, St. Austell, Cornwall.

United Electronics Ltd. Meeting of members will take place at Percy Phillips and Co., 76 New Cavendish St., London W.1, on July 28, at 11 a.m. to receive liquidator's report.

Amendment

Liquidator of Electrical and Car Services (Luton) Ltd., A. G. A. Hayman of 66 Alma St., Luton, was released as from May 5. Previous notice appeared in our June 12 issue.

BANKRUPTCY ACTS

First Meeting

London. M. C. Usher, electrical contractor of 31 Ranelagh Garden Mansions, Hurlingham, S.W.6. First meeting at Bankruptcy Bldgs., Carey St., W.C.2, on July 2 at 11 a.m., and public examination at same address on July 22 at 11 a.m.

Intended Dividends

Portmadoc. Hugh J. O. Evans, electrical engineer trading at High St., Harlech. Last day for receiving proofs, July 1. Trustee is E. S. Browne. 41 North John St., Liverpool 2.

Stockport. Thomas Maund' trading as Beacon Electrical Co. at 80 Wellington Rd. North, Heaton Norris. Last day for receiving proofs, July 1. Trustee is F. C. Ormrod, Official Receiver, 20 Byrom St., Manchester.

Dividends

Hereford. Philip Thomas, radio and electrical engineer trading at 4 New St., Ledbury. First and final dividends of 2s. 4¼d. in £ payable on July 7 at Official Receiver's Office, Somerset House, 37 Temple St., Birmingham.

MEETINGS TO NOTE

MONDAY, JUNE 30

INCORP. PLANT ENGRS. (W. and E. Yorks.).—"Oil Firing." R. Crowther. Leeds University, 7.30 p.m.

ELECTRICAL CONTRACTORS' CONFERENCE opens at Eastbourne and continues until July 2.

TUESDAY, JULY 1

ROYAL AGRICULTURAL SHOW opens today at Newton Abbot and closes on July 4.

TELEPHONE RENTALS LIMITED

Inexplicable Attitude of Capital Issues Committee

THE 23rd annual general meeting of Telephone Rentals Limited was held on June 23, 1952, in London.

Mr. Fred. T. Jackson, O.B.E., COMP.I.E.E. (chairman and joint managing director), who presided said:

As you will have read my address circulated with the Accounts, in which I stated that the Capital Issues Committee had refused our applications for obtaining additional capital, no doubt you will expect me to make some further comment on the position in which your Company finds itself.

The position has not changed: and I consider the attitude of the Capital Issues Committee is quite inexplicable. Your Company has been a successful one over the whole period of its existence, and it has shown increasing profits every year, which proves that the Services we render to Industry are of great value.

The Capital Issues Committee consists of five or six of the leading City men in the realms of Finance and Industry, and the only conclusion I can come to is that we have failed to put over to this Committee the importance of the Services we render to the Commercial and Industrial concerns in this country.

It is not a Service that is easy to put over in words, but only by practical demonstration. And I feel that this is demonstrated by the fact that among our subscribers we embrace a large number of leading concerns in this country, and also Public Utilities and Public Services.

There was never a period in the country's history when it was more essential to introduce something which would increase productive efficiency, save time and improve costing methods.

A very interesting leading article appeared in *The Times* of Friday, June 13, under the heading of "A Long Task," and the last paragraph of this leader sets out in a few words what we claim to do:—"It is an unromantic battle, to be fought in terms of a few less minutes wasted in the day and an addition of a few units to the day's output, just as the consumer has to fight it by paying a few shillings more for his rations. It is only thus that it will be won."

All I can say at present is that we are not prepared to accept the negative attitude of the Capital Issues Committee, and we shall keep on keeping on until they are converted.

We are working strictly within the statement I made in my address issued with the Accounts, and are limiting our Services to firms engaged on Defence Work, Export and Public Authorities, and, of course, carrying out our contractual obligations.

At the moment, I am not able to say more than this. But you will be advised in the Press of any change for the better in the situation.

The report was adopted.

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TRANSFORMERS
If it is
GENERATOR TRANSFORMERS
up to the largest sizes.
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of every type, including pole mounting units
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or
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and you are determined to have the best—backed by over 17,000,000 kVA of transformers in service.
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Testing made easy . . .

The equipment illustrated embodies the necessary control apparatus for testing both single-phase and polyphase watt-hour meters up to a maximum current of 1,000 amperes (or alternatively 500 amperes) and up to 500 volts phase-to-neutral. The equipment is designed for operation from a three-phase, four-wire supply and can be adapted for operation between 346/200 volts and 440/254 volts.

. . . with
POLYPHASE
METER TESTING EQUIPMENT

Outstanding features of this equipment.

- **Exceptionally smart appearance and finish.**
- **Simplicity of control.**
- **All component parts accessible for inspection.**
- **Infinitely fine control of voltage and current from zero to maximum and of power-factor from zero lead to zero lag.**
- **Indicating instruments of high accuracy.**
- **Arrangement of heavy-current conductors to give minimum stray field effect.**
- **Starting-current testing without interfering with other routine tests.**

Typical Testing Rack for Polyphase Meters

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Member of the A.E.I. group of companies

METROVICK *Instruments for precision testing*

CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS · WANTED · FOR SALE · WORK WANTED

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

PRESCOT URBAN DISTRICT COUNCIL

STREET LIGHTING—TRUNK ROAD A.57

THE URBAN DISTRICT COUNCIL invite tenders for the proposed SUPPLY, ERECTION and COMMISSIONING of sodium vapour discharge lighting units on the Liverpool/Warrington Trunk Road A.57 within the Urban District, for approximately 2,886 yards. The drawings and general conditions of contract may be inspected at the Council Offices, Prescot, or at the Liverpool City Lighting Department, 17 Highfield Street, Liverpool 3, and copies of the special conditions of contract and specification and form of tender may be obtained from the former on payment of a deposit of 2 guineas which will be refunded on the submission of a bona fide tender.

Tenders in a plain sealed envelope are to be forwarded to the Clerk of the Council, Council Offices, Prescot, not later than 12 noon on Saturday July 12, 1952. The Council do not bind themselves to accept the lowest or any tender.

F. LAMBERT,
Clerk of the Council.

Council Offices,
Prescot.
June 16, 1952. (A 237)

COUNTY BOROUGH OF HASTINGS

WIRELESS AND TELEVISION RELAY SERVICE

TENDERS are invited for the right to operate within the area of the County Borough of Hastings a BROADCAST RELAY SERVICE for the transmission of both sound and television programmes.

The successful tenderer will be required to enter into an Agreement with the Corporation, and tenders should be submitted on the alternative basis of an Agreement for 21 years or in perpetuity.

A form of tender, together with particulars and conditions relating to the service to be provided, may be obtained upon application to me, and the completed tender should be received in my office not later than 10 a.m. on July 18, 1952.

N. P. LESTER,
Town Clerk.

Town Hall,
Hastings. (A 257)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

SOUTH WESTERN ELECTRICITY BOARD

SENIOR DEMONSTRATOR/HOUSECRAFT ADVISER, West Cornwall District, with Headquarters at Camborne. N.J.C. Grade 2 (£440 to £500).

Applicants must be qualified Demonstrators, holding recognised diplomas in domestic science, and possess E.A.W. Certificate. Must be capable of giving lectures and demonstrations, and of advising consumers on use of electrical equipment.

Detailed applications to Sub-Area Manager, South Western Electricity Board, Pool, Redruth, Cornwall, within 10 days. (A 242)

EASTERN ELECTRICITY BOARD

APPOINTMENT OF SENIOR LEGAL ASSISTANT
26/52 R.

APPLICATIONS are invited from Solicitors for the appointment of a Senior Legal Assistant for general legal work, in the department of the Secretary and Solicitor to the Board.

The salary will be fixed within the range £1,125 p.a. to £1,300 p.a., and future salary and conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidate will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications, to arrive by July 10, 1952, should be made by letter giving full particulars of qualifications and experience to the Secretary, Eastern Electricity Board, Wherstead, Ipswich, Suffolk.

June 18, 1952. (A 239)

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT ENGINEER
Thanet District

SALARY £567 to £579 p.a. under N.J.B. Schedule, Class "E," Grade 9. Superannuable. Applicants should have experience in operation and maintenance of high and low voltages, cables, switchgear, transformers, overhead lines, substations, etc. Appropriate technical qualification an advantage.

Applications, giving two referees, must reach H. J. C. Carte, M.B.E., A.I.E.E., Thanet Manager, SEEBoard St. Peter's, Broadstairs, Kent, through the local Employment Exchange, by July 9, 1952.

A. L. BURNELL,
Secretary.

June, 1952. (A 263)

BRITISH ELECTRICITY AUTHORITY

South West Scotland Division

A SHIFT CHARGE ENGINEER is required at Kilmarnock Generating Station for which the salary will be within the range £677 to £696 per annum, this being in Class "F," Grade 7 of the National Joint Board Schedule.

In filling the above, vacancies may occur for an Assistant Shift Charge Engineer (Grade 9) and a Station Shift Control Engineer (Grade 10) at Kilmarnock or at other generating stations within the Division.

Applications on Form A.E.6 should be sent to the Divisional Secretary at 168 Broomhill Drive, Glasgow W.1, not later than June 21, 1952.

A. CHRISTIANSON,
Divisional Secretary.

June 9, 1952. (A 209)

YORKSHIRE ELECTRICITY BOARD

No. 5 (Wakefield) Sub-Area

APPLICATIONS are invited for the following appointment:—

ASSISTANT INSTALLATION ENGINEER
(Castleford District) (Vacancy No. 79/52)

Applicants must have had a sound technical education and practical experience in electrical contracting work of all types. They must be capable of preparing and supervising schemes for all classes of domestic, commercial and industrial installations, including specifications, estimates and tenders. Experience in electrical appliance repairs would be considered an advantage. Applicants must have had considerable experience in the control of workmen.

Salary, N.J.B., Class "E," Grade 10, £535 to £549 per annum.

Applications, stating the above vacancy number, and giving full details of age, qualifications and experience, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Road, Wakefield, not later than July 2, 1952. (A 208)

NORTH WESTERN ELECTRICITY BOARD

JUNIOR ENGINEERS

JUNIOR ENGINEER is required in the Design and Planning Section, Town Hall, Manchester. Applicants should have received a technical education to H.N.C. level and have served an engineering apprenticeship or received equivalent training. The duties involve the preparation of schemes and estimates for extensions to a large city network and associated protective gear and metering problems. Drawing office experience an additional qualification.

JUNIOR ENGINEERS (TESTING ASSISTANTS) are required in the No. 1 Sub-Area, Manchester. Applicants should have had experience of testing meters, instruments or protective equipment, and should hold the O.N.C. in Electrical Engineering.

Salary scale: £375 to £527 p.a. Grades M.21/17. N.J.B. Conditions.

Applications for the above posts to the Sub-Area Secretary, No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester 2, P.O. Box 493, by July 5, 1952.

DISTRICT COMMERCIAL ENGINEER
Macclesfield District

Duties will include: Organisation and control of all commercial staff and functions in the District; supply of information and advice to consumers on electricity utilisation, tariffs, terms, apparatus and all matters concerning electricity services; organisation and supervision of maintenance work on consumers' premises including emergency service, routine testing and repair of domestic appliances, including control of workshops; control of Service Centres and Exhibitions; supervision of consumer records.

Salary scale: £833 to £868 p.a. Grade E.3. N.J.B. conditions.

Application forms can be obtained from the Sub-Area Manager, No. 7 Sub-Area, The North Western Electricity Board, Chapel Street, Hazel Grove, Cheshire, and must be returned to him by July 12, 1952. (A 255)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Salaries, including London Allowance, and conditions of service in accordance with N.J.B. Schedule "A."

ASSISTANT ENGINEER (ELECTRICAL TESTING)
Battersea Generating Station

The engineer appointed will be required to act as an assistant to the engineer engaged on testing of all internal electrical equipment at Battersea, including testing of protective gear on works auxiliaries, fault location, etc. He should have received a sound practical training in electrical engineering and have obtained some recognized technical qualification. Salary, Class "L," Grade 15, £561 15s. p.a.

ASSISTANT ENGINEER (STATISTICS)
Deptford East Generating Station

Qualifications: Good general and technical education, with preferably National Certificate in Mechanical or Electrical Engineering or equivalent. Able to compile and present statistical data relating to operation, station efficiency. Salary, Class "H," Grade 14, £504 p.a.

Applications, stating age, qualifications and experience, to Divisional Secretary, B.E.A., London Division, Ergon House, Horseferry Road, S.W.1, within 14 days of this advertisement. (A 262)

THE BRITISH IRON AND STEEL RESEARCH ASSOCIATION

TECHNICAL ASSISTANTS required by the Electrical Engineering Section of the Plant Engineering Division of the above Association to assist in research on a wide range of electrical engineering problems both in iron and steel works and in the Association's engineering laboratories in London. Applicants should have a National or Higher National Certificate in electrical engineering. Starting salary in accordance with age, qualifications and experience.—Written applications only to Personnel Officer, B.I.S.R.A., 11 Park Lane, London W.1. (A 211)

BRITISH ELECTRICITY AUTHORITY

South Western Division

JUNIOR ENGINEER (CONTROL) required at Hayle Generating Station.

Superannuation scheme. Salary in accordance with Clause 35 of the N.J.B. Agreement, Class "F," commencing at Grade 15, £375 p.a.

Applicants should possess O.N.C. in Electrical or Mechanical Engineering or equivalent. Previous generating station experience considered an advantage.

Apply by July 5, 1952, stating age, qualifications, experience, present appointment and salary, to R. C. Barrett, Divisional Secretary, 26 Oakfield Road, Bristol 8. June 18, 1952. (A 241)

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following positions:—

S/13.319 (a) SENIOR DRAUGHTSMAN (MECHANICAL)
(b) DRAUGHTSMAN (MECHANICAL)

Applicants should have had experience of work concerning turbines and auxiliaries, boilers and auxiliaries, coal and ash handling plant and pipework.

Salary: (a) N.J.B. Schedule "D," Grade 5, £547 to £651. (b) N.J.B. Schedule "D," Grade 6, £413 to £547.

S/13.326 MECHANICAL MAINTENANCE ENGINEER
Oxford Generating Station

Applicants should have had experience in the maintenance of generating station boiler plant, be capable of taking control of the maintenance staff and supervising turbine and boiler overhauls.

Candidates should have had a sound mechanical training and preference will be given to applicants holding qualifications leading to membership of a recognised professional Institution.

Salary, N.J.B. Schedule "A." Class "D," Grade 6, £645 to £668.

Application forms for all the above posts are obtainable from P. D. A. Oliver, Esq., Divisional Secretary, British Electricity House, High Street, Portsmouth, and must be returned not later than July 9, 1952. (A 280)

NOTTINGHAMSHIRE COUNTY COUNCIL

County Architect's Department

APPLICATIONS are invited for two superannuable posts of ASSISTANT ELECTRICAL ENGINEER at salaries within £600 by £20 p.a. to £660 or £570 by £15 p.a. to £620 according to qualifications and experience.

Applicants should be Associate Members of the Institution of Electrical Engineers. They must be capable draughtsmen with experience in the preparation of schemes, specifications and estimates for all classes of electrical installation work.

Application forms and further particulars are obtainable from the County Architect, County Hall, Trent Bridge, Nottingham, to whom applications should be sent by July 11, 1952.

Canvassing disqualifies.

K. TWEEDALE MEABY,
Clerk of the County Council.
(A 238)

SOUTHERN ELECTRICITY BOARD

SENIOR INTERNAL AUDIT ASSISTANT

CHIEF Accountant's Department at Southern Electricity House, Maidenhead. Salary N.J.C. Grade 7 (£755/£845 per annum), N.J.C. conditions of service.

Applicants should have sound accounting and auditing experience. The possession of a recognised accountancy qualification and knowledge of accounting methods in the electricity supply industry will be an advantage. The successful applicant will be required to undertake responsibility for internal audit work in various parts of the Board's area and may be required to be absent from home five days a week during most of the year.

The successful candidate for the above appointment will be required to contribute to the B.E.A. and Area Boards' Superannuation Scheme, if eligible.

Applications on forms obtainable from the Secretary, Southern Electricity House, Littlewick Green, Maidenhead, and returned to him not later than July 18, 1952.

F. W. KEMPTON,
Secretary.
June 26, 1952. (A 240)

HARLOW DEVELOPMENT CORPORATION

TECHNICAL ASSISTANT
(ELECTRICAL, HEATING AND VENTILATING)

APPLICATIONS are invited for the above appointment in Grade IV (a) salary £600 by £25 to £700 per annum, in the Architect Planner's Department (Frederick Gibberd, F.R.I.B.A., M.T.P.I.) to work under the direction of the Executive Architect (V. Hamnett, B.Sc., A.R.I.B.A., A.M.P.T.I., A.R.I.C.S.).

Applicants should possess appropriate technical qualifications and be experienced in preparation of electrical specifications and supervision of works, and have good knowledge of heating and ventilation of factories and multiple dwellings.

The appointment will be in accordance with the Corporation's conditions of service, which are similar to those of the professional and technical grades of local authorities staffs, and will in particular involve a contribution to an approved superannuation fund.

Housing accommodation may be made available in due course to the successful applicant.

Applications, giving full details, together with the names of two referees, should be addressed to the undersigned, to reach him not later than July 11, 1952.

W. ERIC ADAMS,
General Manager.
"Terlings," Gilston,
Harlow, Essex. (A 266)

AUSTRALIA
THE SNOWY MOUNTAINS HYDRO-ELECTRIC AUTHORITY

APPLICATIONS are invited for appointment to the following positions. In all cases the commencing salary in any particular grade will be determined after interview, in accordance with qualifications and experience. The salaries quoted are in Australian currency and the particular qualifications required are shown hereunder:—

CIVIL ENGINEERS

1. EXECUTIVE ENGINEERS, Grade III—£2,006 to £2,316 p.a.

(a) Dam Design. A comprehensive knowledge of modern engineering techniques and criteria pertaining to the design of high dams and ability to plan integrated engineering programmes and field investigations, carry out comparative analyses of alternative types and direct preparation of designs, estimates and specifications.

(b) Contracts. Extensive experience in the driving and operation of large underground tunnels and in the supervision of large contracts for the construction of hydro-electric works or similar projects. A sound knowledge of contract procedures and administration.

(c) Road Development. Extensive experience in the planning, including selection of routes, survey, design and construction of road works preferably in mountainous country.

2. EXECUTIVE ENGINEER, Grade II—£1,696 to £1,944 p.a.

Tunnel Design. Extensive experience in the design of tunnels, pressure shafts and surge tanks for hydro-electric projects and ability to direct the preparation of detailed designs, estimates and specifications for such works and plan field investigations.

3. EXECUTIVE ENGINEERS, Grade I—£1,388 to £1,696 p.a.

(a) Design. Extensive experience in the design of large underground and surface hydro-electric power stations and ability to direct the preparation of detailed designs, estimates and specifications for such works.

(b) Construction. Extensive experience in the construction of hydro-electric works, including planning, the preparation of estimates and works programmes and the forecasting of resources required to carry out programmes.

4. ENGINEERS, Grades I to IV—£764 to £1,388 p.a.

Experience in investigating, designing and construction, including supervision of construction by contract of hydro-electric works or similar civil engineering projects.

5. ENGINEER, Grade II—£1,052 to £1,100 p.a.

Experience in soil conservation practice over a period of not less than eight years.

6. ENGINEERING GEOLOGISTS, Grades I to III—£800 to £1,208 p.a.

Experience in general engineering geology and/or petrography with special reference to concretes.

MECHANICAL ENGINEERS

1. EXECUTIVE ENGINEER, Grade III—£2,006 to £2,316 p.a.

or

EXECUTIVE ENGINEER, Grade II—£1,696 to £1,944 p.a.

Area Power Plant Engineer. Extensive experience in inspection, installation, commissioning and maintenance of water power plant (turbines, valves, gates, etc.), stationary diesel engines, hydraulic and mechanical plant associated with power projects, design and selection of power plant. Experience also in the mechanical aspect of the above in relation to major electrical generating plant and ability to supervise and direct staff.

2. EXECUTIVE ENGINEERS, Grade II—£1,696 to £1,944 p.a.

or

EXECUTIVE ENGINEERS, Grade I—£1,388 to £1,696 p.a.

(a) Power Plant Engineer. Extensive experience in the investigation, design, specification, selection, procurement and testing of water turbines, stationary diesel engines and associated mechanical equipment and the inspection, installation, operation and maintenance of same.

(b) Hydraulic Plant Design. Extensive experience in the investigation, design, specification, selection, procurement and testing of hydraulic gates (spillway, intake, diversion, draft tube, etc.), supporting frames, lifting and control gears, screens, valves and pumps.

(c) Area Mechanical Engineer. Extensive general mechanical experience, including direction of major workshops for repair and maintenance of heavy earth-moving equipment and transport vehicles, and the installation and maintenance of mechanical building services, installation and maintenance of permanent power plant, etc.

3. ENGINEERS, Grades I to IV—£764 to £1,388 p.a.

Mechanical engineering experience in the following fields:—

(a) Design, specification of cranes, haulages, etc.

(b) Design, specification of heating, ventilating equipment, etc.

(c) Operation of base and field workshops for transport and earth-moving plant.

(d) Co-ordination and control of field activities associated with the above.

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ELECTRICAL ENGINEERS

1. EXECUTIVE ENGINEER, Grade I—£1,388 to £1,696 p.a.

Extensive experience in the organisation, control and construction of e.h.t. lines up to 330 kV. Field experience and ability to organise and supervise construction groups essential.

2. ENGINEERS, Grade I to IV—£764 to £1,388 p.a.

Electrical power engineering experience in the following fields:—

(a) Layout of primary and secondary installations for hydro-electric power stations and associated switching and terminal stations.

(b) Protection of long h.v. transmission lines, power station and switching station equipment.

(c) Operation and maintenance of large power systems.

(d) Construction of power stations, switching stations and/or transmission systems.

(e) Layout and installation of communication schemes for large power system operation.

SUPERVISING ARCHITECT

ARCHITECT (Grade IV)—£1,298 to £1,388 p.a.

Extensive practical experience in supervision of contract work and the administration of contracts. Knowledge of business methods. Experience as contractor on own account preferred.

Except for the last-mentioned position, applicants for which must be qualified architects, the academic qualifications required are a degree from a recognised University, corporate membership of the Institutions of Civil, Mechanical or Electrical Engineers or equivalent professional qualifications.

Subject to certain conditions, including a bond of £100 to remain with the Authority for at least two years, the fares of successful applicants and their dependents will be paid by the Authority. Salaries commence from date of entry on duty in Australia where temporary hotel or guest house accommodation will be arranged until a flat or cottage can be provided on a rental basis.

Each applicant should state his age, nationality, marital status, present position and salary and give full and complete particulars of his qualifications and experience. Applications should be addressed to the Engineer-in-Charge, Snowy Mountains Hydro-Electric Authority, 18 St. George Street, Hanover Square, London W.1. The Authority cannot undertake to acknowledge all applications. Communications will be sent only to those applicants required to attend for interview. (A 265)

THE NORTH WESTERN ELECTRICITY BOARD
No. 4 Sub-Area

APPOINTMENT OF (a) MAINS FOREMAN, AND (b) CHARGE HAND LABOURERS (CABLE LAYING) FOR WORK ON THE FYLDE COAST

MAINS FOREMAN

EXPERIENCE in handling large gangs of men on excavation work and supervision of large contracts essential. Conditions N.J.I.C. Present rate 4c·50d. plus not less than 4d. per hour for foreman's duties. 44-hour, 5-day week.

CHARGE HANDS

Experience in supervision of men and laying of high voltage cables essential. Conditions N.J.I.C. Present rate 32·25d. plus 2d. per hour for charge hand's duties. 44-hour 5-day week.

Applications, with full particulars, through the Ministry of Labour and National Service, to The Manager, No. 4 Sub-Area, North-Western Electricity Board, 40/41 Lune Street, Preston, by July 5, 1952. (A 281)

BRITISH ELECTRICITY AUTHORITY
Midlands Division

JUNIOR ENGINEER required in the Technical Department, Metering Section. N.J.B. service conditions, superannuable appointment, salary within the range of Schedule "C," Grade 9, £375 to £552 per annum.

Duties consist mainly of the calibration of meters and instruments in the electrical laboratory, and previous experience on metering is essential.

Forms of application available from the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, to be returned by July 12, 1952.

F. W. LAWTON,
Divisional Controller.
(A 243)

THE NORTH WESTERN ELECTRICITY BOARD
No. 1 Sub-Area

Amended Advertisement

PRINCIPAL ASSISTANT (STATISTICS) required in the Technical Engineer's Department, No. 1 Sub-Area, Manchester. Applicants should have had a good education and training in advanced statistical work. The duties require a wide experience of the electricity supply industry and a knowledge of statistics particularly as applied to the production of records and charts.

Salary: £755-£845 p.a. N.J.C. conditions.

Apply to the Sub-Area Secretary, No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester 2, P.O. Box 493, by July 5, 1952. (A 244)

YORKSHIRE ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

No. 3 (Sheffield) Sub-Area

GENERAL ASSISTANT DISTRICT ENGINEER
(Vacancy No. 80/52.) (Rotherham District)

Applicants should have a good general and technical education with practical training in an engineering workshop, or in the Electricity Supply Industry. Experience in the construction, operation and maintenance of H.V. and L.V. underground and overhead distribution is necessary.

Candidates should be prepared to reside in the District. Salary, N.J.B. Class "G", Grade 11, £553 to £576 per annum.

Applications, stating the above vacancy number, and giving full details of age, qualifications, and experience, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield, not later than July 10, 1952.

No. 1 (Bradford) Sub-Area

HOUSECRAFT ADVISER (FEMALE)
(Vacancy No. 81/52)

Applicants should be qualified Demonstrators holding recognised diplomas in Domestic Science, and possess the E.A.W. Certificate. They must have had considerable experience in the organisation of a demonstration and lecture service, control of staff, and be capable of establishing relations with Education Authorities, Institutions, industrial and commercial catering establishment, and advising them on the use of electrical equipments.

Salary, N.J.C. Grade 3, £500 by £20 to £560 per annum.

Applications, stating the above vacancy number, and giving full details of age, qualifications, and experience, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53 Sunbridge Road, Bradford, not later than July 10, 1952. (A 256)

AGENTS on commission with good contacts Electricity Boards and Electrical Contractors, Midlands and Northern England, required by manufacturer of well-known cooker component. State area covered and other lines covered.—Box No. 1831, Electrical Times. (A 259)

ASSISTANT ENGINEERS required immediately, preferably experienced in the survey and construction of overhead transmission lines mainly wood pole type. —Give full details of age, education, experience and salary expected to Box No. 870, Keith & Co., Advertising Agents, Edinburgh. (A 260)

ASSISTANT ENGINEER required by important manufacturing company in North-east London, for commercial and technical work in transformer sales and contracts department, with special reference to on-load tap-changing equipment. Degree standard or equivalent. —Write, stating age, education, experience and salary required, to Box No. 1833, Electrical Times. (A 269)

BRITISH ELECTRICITY AUTHORITY require a SECOND ASSISTANT ENGINEER (HYDRO) to initiate and co-ordinate technical and economic investigations into schemes for hydro-electric generation and similar works, and co-ordinate proposals for their general design and layout. Candidates should have an engineering degree or equivalent qualification, and experience in the development and economic assessment of hydro-electric schemes. Salary, N.J.B. Grade 3, £814 to £1,184 including London Allowance. Pension scheme.

Applications, which will be acknowledged, should be made on forms obtainable from D. Moffat, Director of Establishments, British Electricity House, Great Portland Street, London W.1, to be returned by July 14 1952. Quote reference AE/264. (A 267)

EFFICIENCY ENGINEER. Large modern power station in London district invites applications from men not more than 45 years of age. Candidates must have had good power station experience, a knowledge of principles of combustion, heat balances, economics of plant operation and possess at least Higher National qualifications. Non-contributory pension scheme. Commencing salary £950 approximately. Very good prospects for a suitable man.—Reply to Box No. 1813, Electrical Times, quoting reference T/EE. (A 172)

ELECTRICAL ENGINEER OR PHYSICIST with Higher National Certificate or equivalent is required for the design of small quantities of special transformers for experimental apparatus. This appointment is at Stanmore.—Apply to the Staff Manager (Ref. GBLC/S.216), Research Laboratories of the General Electric Co., Ltd., Wembley, Middlesex, stating age, qualifications and experience. (A 185)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

REQUIRED BY THE STEEL COMPANY OF WALES LIMITED

POWER PLANT SHIFT CHARGE ENGINEER
Applicants should have served a recognised apprenticeship with a major engineering company, and have a sound general and technical education. Experience in the following is desirable:—

(a) As Shift Charge Engineer.
(b) High pressure boiler and turbine operation.
(c) Operational control of an interconnected H.T. industrial network.
(d) Other works auxiliary services.

Salary according to age and experience. The post will be permanent and pensionable on satisfactory service.

Applications in own handwriting should be addressed to: The Personnel Superintendent, The Steel Company of Wales Limited, Box No. 3, Port Talbot. (A 206p)

ELECTRICAL DRAUGHTSMAN required. Diagrams and general layouts also cable runs similar to power-station work.—State age, salary required according to experience, to Box No. 1817, Electrical Times. (A 189)

ELECTRICAL ENGINEER required for Electrical Department of Works in the North East. Should have a sound practical training, drawing office experience, a knowledge of motor control-gear resistance calculations, and preferably some experience of electrical heating for Industrial applications.—Apply, giving full details of experience, technical qualifications, age, whether married or single, and salary required to Box No. 1803, Electrical Times. (A 147)

ELECTRICAL ENGINEER DRAUGHTSMAN required with experience in the design and installation of power and lighting schemes, distribution and control diagrams, etc. Excellent prospects for suitable men offered by Tees-side firm.—Apply, giving full particulars to Employment Exchange, Stockton-on-Tees. (A 247)

ELECT. DRAUGHTSMAN reqd. Mid. East.—State age, exp., etc. Box No. 1835, Electrical Times. (A 272)

ELECTRICAL DRAUGHTSMAN required with some estimating experience on construction and factory maintenance.—Apply Employment Manager, Vickers-Armstrongs Ltd. (Aircraft Section), Weybridge, Surrey. Applications, with certain exceptions, are subject to the approval of the Ministry of Labour and National Service. (A 270)

ELECTRICIAN, technically trained, with knowledge of drawings, required for getting out schemes, routing cables, etc.—Reply, stating age, experience and salary required, to Box No. 1837, Electrical Times. (A 273)

EWBANK AND PARTNERS, LTD., have vacancies for the following:—

ELECTRICAL ENGINEERING DRAUGHTSMEN experienced in Power Station and sub-station distribution systems.

MECHANICAL ENGINEERING DRAUGHTSMEN experienced in power station design and layout, pipework layout, circulating water systems or coal and ash handling plants.

TRACERS (FEMALE) experienced in power station and general engineering work.

The positions are permanent and are pensionable. Free lunches are provided and a five-day week is in operation. Applicants should write in first instance, stating age, details of experience and salary required to: The Secretary, Ewbank and Partners Ltd., Engineering Consultants, 10/11 Grosvenor Place, S.W.1. (A 174)

FOREMAN to take charge of Electrical Contracting department. Must be capable of planning and estimating for industrial and Domestic work, including maintenance.—Simpson Brothers (of Hapton), Ltd., Hapton, Nr. Burnley, Lancs. (A 199)

JOHNSON AND PHILLIPS, LTD., switchgear Works in Johannesburg, South Africa. SENIOR SWITCHGEAR DESIGN AND DEVELOPMENT DRAUGHTSMAN required for power station and control gear ranging from medium to high voltage (11 kV). Only experienced men, not above 35 years of age, need apply.—Reply, stating age, salary and experience to Employment and Welfare Manager, Johnson and Phillips, Ltd., Charlton, S.E.7. (A 188)

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

GRADUATE ELECTRICAL ENGINEER for electrical laboratory work associated with cable development. Previous experience not essential. Salary according to experience and qualifications.—Applications, in writing, to The Staff Officer, British Insulated Callender's Cables Ltd., Prescot, Lancs. (A 271)

LEADING AND SENIOR DRAUGHTSMEN required for Transformer work of the largest class.—Apply by letter quoting Transformer and giving full details of age, experience and salary required to Staff Manager, The General Electric Co. Ltd., Witton, Birmingham 6. (A 258)

MANUFACTURERS of lighting equipment and other metal products require keen young MANAGER to take charge of London office and stores. Executive ability, some experience electrical wholesale trade essential.—Full details, age, qualifications, etc., to Sales Director, R. and A. G. Crossland Ltd., Neptune House, Water Lane, London E.C.3. (A 268)

PIRELLI-GENERAL CABLE WORKS LTD. have Sales Department STAFF VACANCIES for General Correspondence and preparation of Mains Cable Tenders.—Apply in writing to Sales Manager, Eastleigh Works, near Southampton. (A 225)

PRODUCTION ENGINEER/WORKS MANAGER required with wide practical experience of mass production methods of manufacture, processes and assembly of small electrical components including Works Planning and progress. This vacancy offers an unusual opportunity and salary to a keen engineer having good organising ability, initiative and drive. This post is permanent and progressive and offers ample scope for future advancement to the right man.—Write in confidence giving full details of past experience to Box No. 1841, Electrical Times. (A 285)

QUALIFIED ELECTRICAL ENGINEER, A.M.I.E.E. or exemoting examination, aged 27-38 years, possessing a comprehensive knowledge of electrical installation work in all types of buildings, including factories, hospitals, schools, cinemas, etc., and fully conversant with the recognised wiring systems and all relevant regulations governing this type of work. Must possess knowledge of building construction and be capable of reading architects' and engineers' drawings. Able to prepare complete electrical specifications and illumination schemes. Successful applicants will be required to work in Glasgow or Edinburgh. Candidates should be of Scottish birth or extraction. Five-day week. Pension fund. —Reply to Box No. 1827, Electrical Times, giving details of age, qualifications, experience and salary required. (A 245)

SALES MANAGER. A large company manufacturing heavy electrical equipment wish to appoint a manager for their home sales department at their factory and a manager for the London sales office. Candidates must be corporate members of I.E.E. with sound technical training and considerable sales experience. Age range 30-45 years. Salaries £1,000-£1,500. Dependent on qualifications and experience.—Full details of qualifications, etc., to Box No. 1829, Electrical Times. (A 246)

SALES REPRESENTATIVE with knowledge of E.L.M.A. lamps, lighting equipment, cables, etc., required for London area by well-known electrical manufacturers.—Write, stating age, experience and salary required, to Box No. 1839, Electrical Times. (A 275)

THE ENGLISH ELECTRIC COMPANY, LIMITED requires several qualified and experienced DOMESTIC APPLIANCE ENGINEERS for development work on new appliances at Liverpool. Permanent, pensionable positions will be offered to successful applicants.—Please write, giving full details of qualifications and experience and quoting Ref. 452 to Central Personnel Services, English Electric Co., Ltd., 24-30 Gillingham Street, London S.W.1. (A 248)

REQUIRED AT THE MARGAM WORKS OF THE STEEL COMPANY OF WALES LIMITED
POWER STATION SHIFT CONTROL ENGINEERS
Applicants must produce evidence of advanced technical education, and have experience in the control of an inter-connected H.T. network. Some experience in H.P. industrial boiler and turbine operation would be an advantage.
Salary, which is pensionable, according to age and experience. Applications should be in own handwriting addressed: The Personnel Superintendent, The Steel Company of Wales Limited, Box No. 3, Port Talbot. (A 207p)

TRANSFORMER DRAUGHTSMEN required with some experience on units in the range 500 to 10,000 kVA. Salary according to qualifications.—Apply Technical Director, Bryce Electric Construction Co. Ltd., Kelvin Works, Hackbridge, Surrey. (A 274)

TRANSFORMERS & WELDERS, LTD., Sandown Road, Watford, have vacancies for fully experienced TRANSFORMER DRAUGHTSMEN. Specialised knowledge of arc furnace transformer design an advantage. —Please give full details of experience, age, and salary expected. (A 176)

WORK WANTED

A.C. and d.c. Motor Rewinds and Repairs. Prompt service, fully guaranteed. Edgware 8631 (4 lines). —Service Electric Co., Ltd., Stanmore, Middx. (A 19)

ARMATURE RE-WINDING SERVICE TO THE TRADE. Vacuums, drills, grinders, hood dryers, dental motors, vacuum cleaner armatures replaced from stock, 24 hours service. Every job guaranteed.—Regam Electric, 95 Park Lane, Leeds 1. (A 213)

CAPACITY AVAILABLE for small component and sub-assembly work. Any quantities considered. Work can start immediately.—Box No. 1789, Electrical Times. (A 107)

CASTINGS, Fisher Foundries, Ltd., Greet, Birmingham, have capacity for brass, gun metal and soft grey iron machine moulded repetition castings weighing 1-30 lb. Loose pattern work up to 3 cwt. Delivery by road to all parts. Tel.: B'ham, Victoria 0197. (A 25)

FLUORESCENT FITTINGS, SHELLS, etc. Sheet metal work for the electrical and allied trades. Lowest trade prices. Guaranteed quality.—Cowling and Holdsworth, Ltd., Romside Trading Estate, North Street, Romford 7282. (A 191)

METALWORK. All types, cabinets, chassis, racks, etc., to your own specifications.—Philpott's Metalworks Ltd., Chapman Street, Loughborough. (A 26)

OXY-ACETYLENE and Electric Welding. Capacity available for small fabrication in all materials.—Refinery Equipment, Monton Road, Eccles. (A 229)

PRESSINGS. Assemblies, wire work, spot and arc welding, capstan work. Quick service. Large quantities material available. Quotations by return. Specialists in sub-contract work.—Mountsorrel Pressings, 14-20 Loughborough Road, Mountsorrel. (A 34)

WANTED

A.C.—D.C. MOTORS, STARTERS, complete change-over installations, etc.—A.A. Electrical Co., Ltd., 67 Rothschild Road, Chiswick Park, W.4. Tel.: Chiswick 5105. (A 11)

WANTED, ROTARY CONVERTORS, any size.—Universal, 221 City Road, London E.C.1. (A 9)

WANTED. Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock Water-tube Boilers. Best prices paid. Prepared to purchase Babcock and Wilcox Water-tube Boilers for dismantling. —Apply, giving full details, to Midland Iron and Hardware Co., Cradley Heath. (A 3)

WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper, Ltd., 176 Brady Street, Bethnal Green, E.1. (A 1)

WANTED. D.C. and A.C. ball-bearing MOTORS, MOTOR GENERATOR SETS, DYNAMOS and ALTERNATORS.—Full details to Britannia Manufacturing Co., Ltd., 22-26 Britannia Walk, London N.1. (A 7)

£50,000

Immediate cash available for purchase of New Ball and Roller Bearings, all types, Steel Balls and Rollers. Top prices paid, small quantities accepted.

CLAUDE RYE BEARINGS
895-921 Fulham Road, London, S.W.6
RENown 6174 (20 lines) (A 31p)

FOR SALE

CABLES & WIRE

BRIGHTRAY, 41 gauge. Quantity for sale, surplus to requirements.—Industrial Services, 20 Talbot Street, Cardiff. (A 169)

CABLE 7·052 P.B.J. 100,000 yards for sale from stock at well below makers' price, on drums of 5,000 yards.—S. G. Young, 154/6 Blackfriars Road, S.E.1. WATerloo 3131. (A 150)

FOR SALE—COPPER CABLE, new, Armorduct make, offered at cost, near offer considered. Stored London, inspection arranged. 36,500 yds 3/0·036 single H.S.O.S. V.I.R. at £17 per 1,000 yds. 15,500 yds 7/0·029 twin-braided V.I.R. at £36 per 1,000 yds. Both 250 V rate. Packed hessian and wooden cases.—Crowlas Trading Co., 11 Soho Square, W.1. Tel.: GERrard 5731 (A 283)

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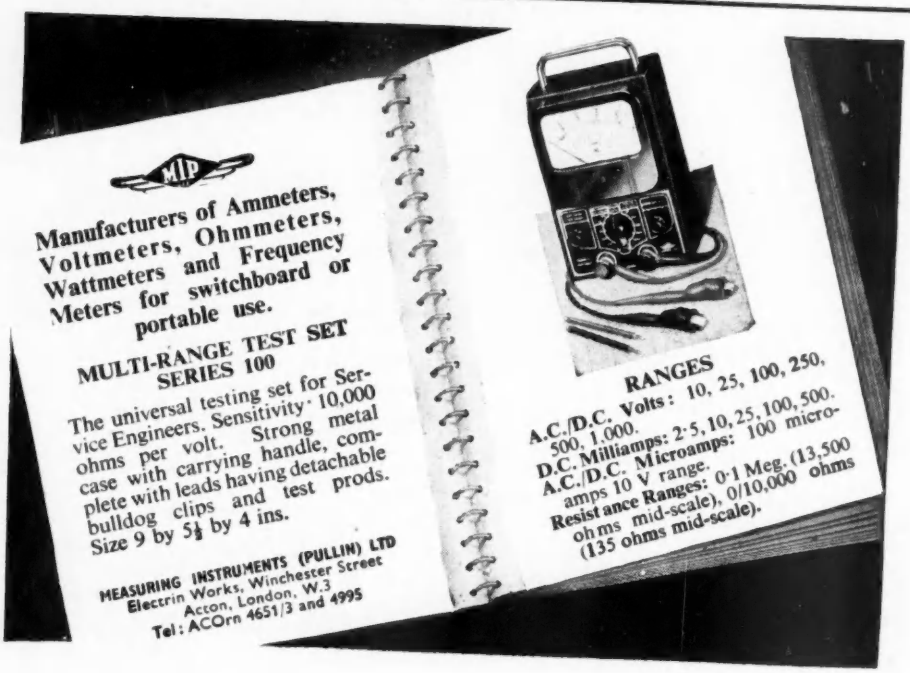
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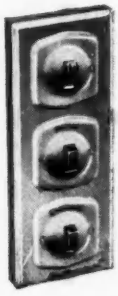

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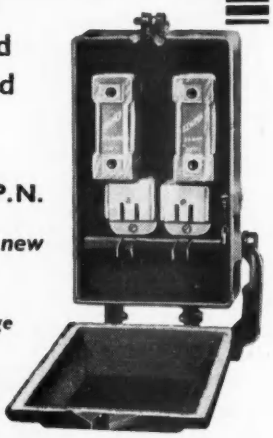

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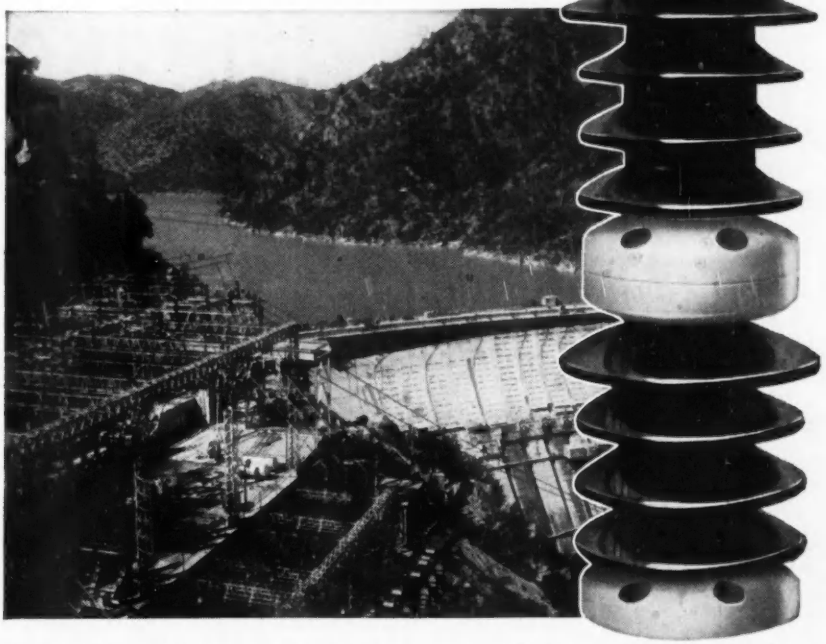

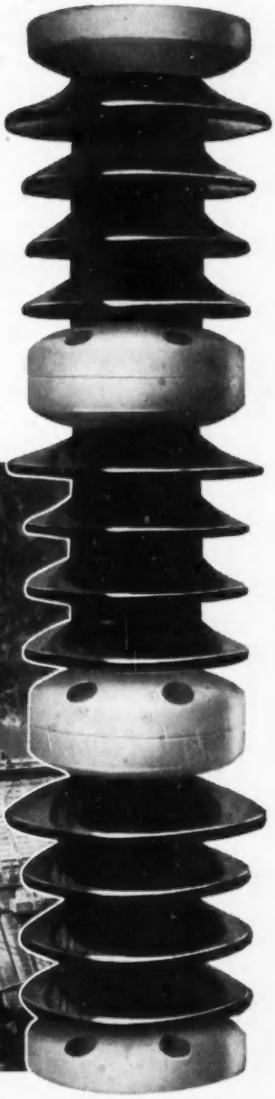

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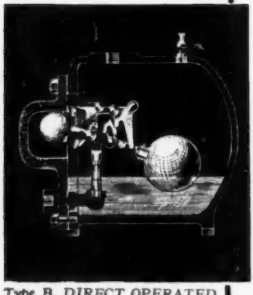

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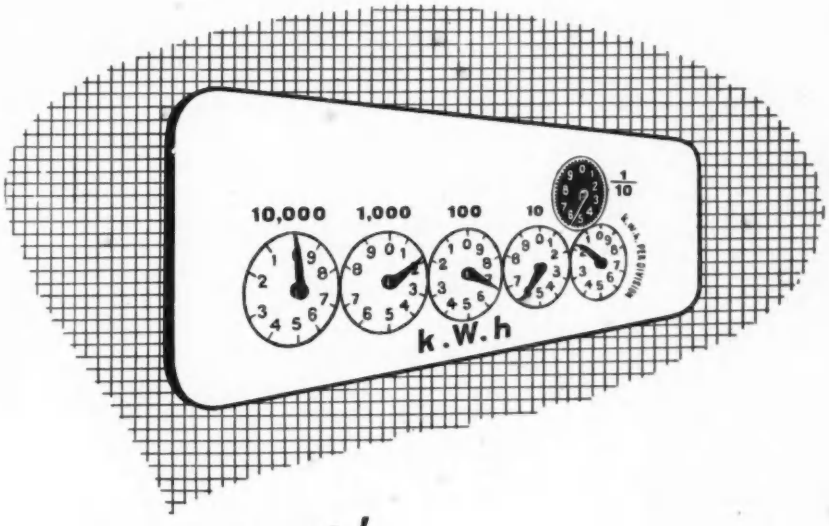

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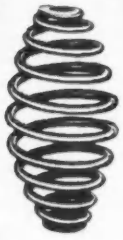

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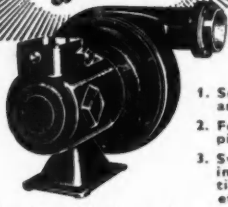

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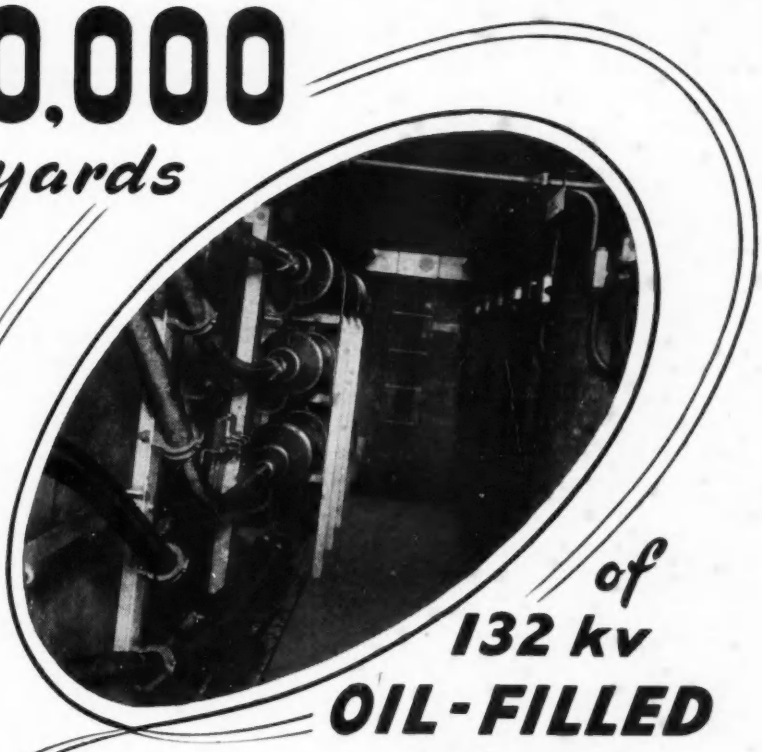

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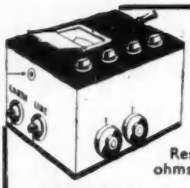

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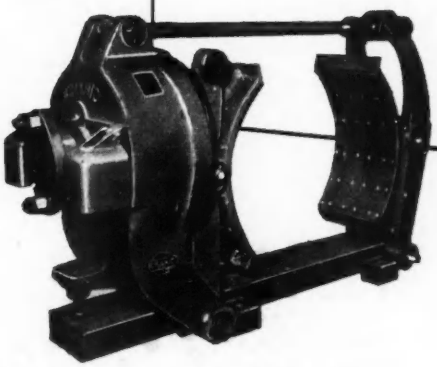

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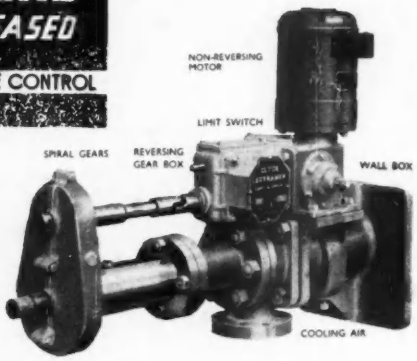

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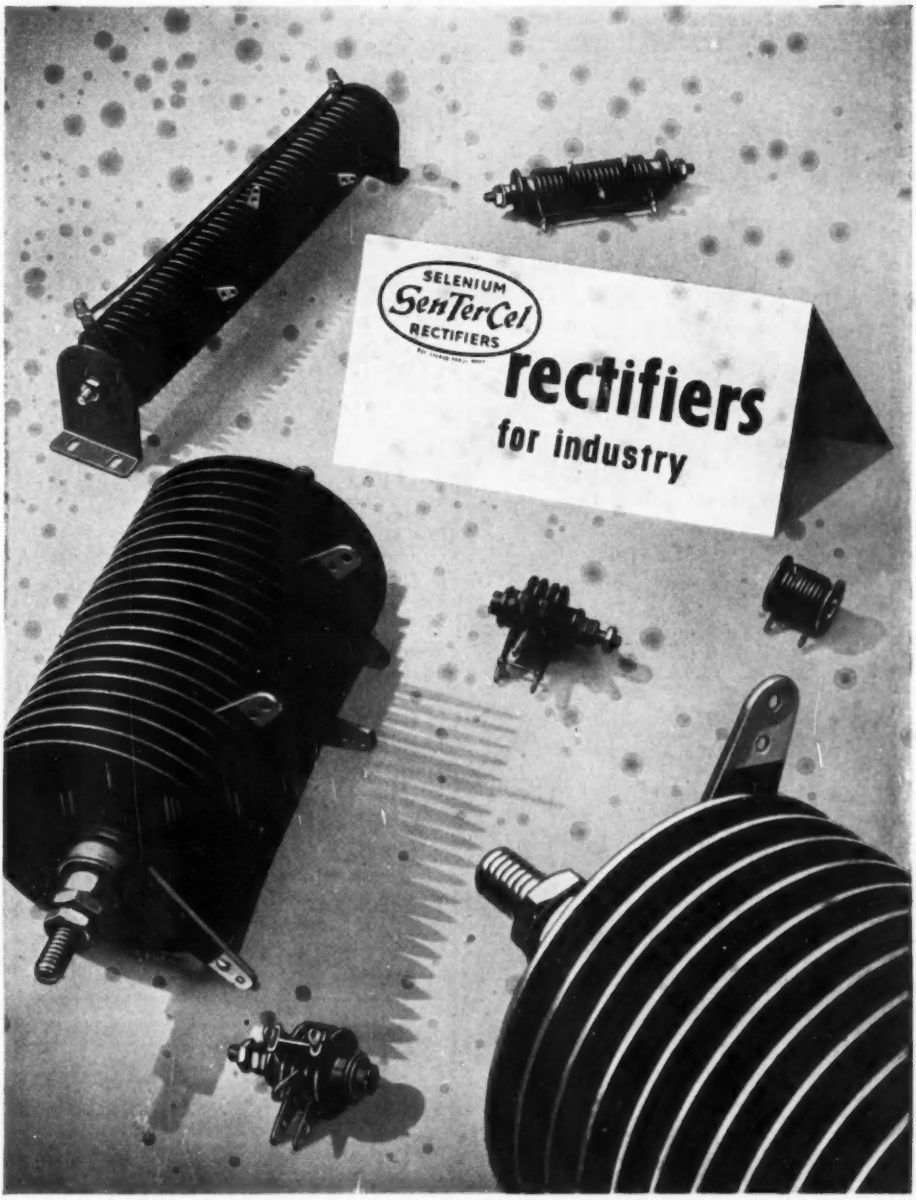

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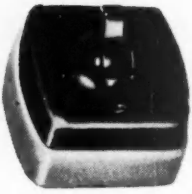
JUST  ONE

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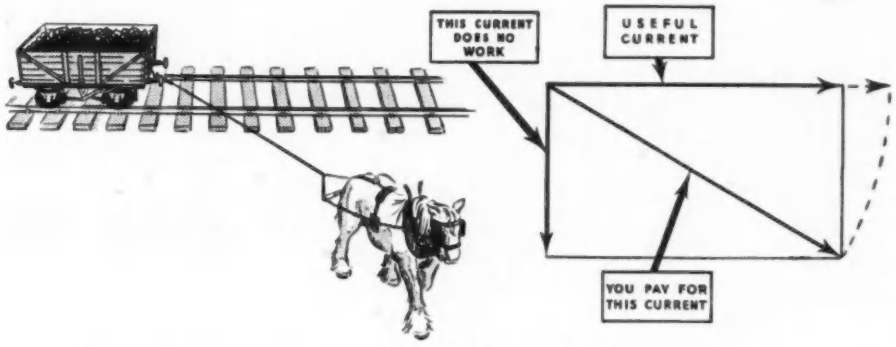

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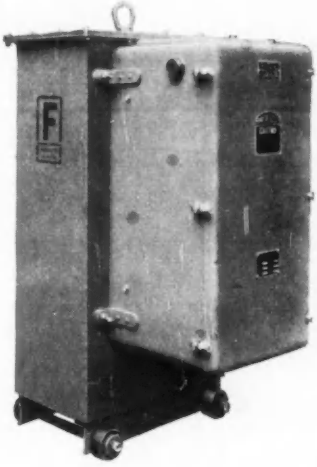

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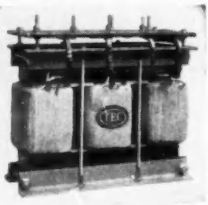

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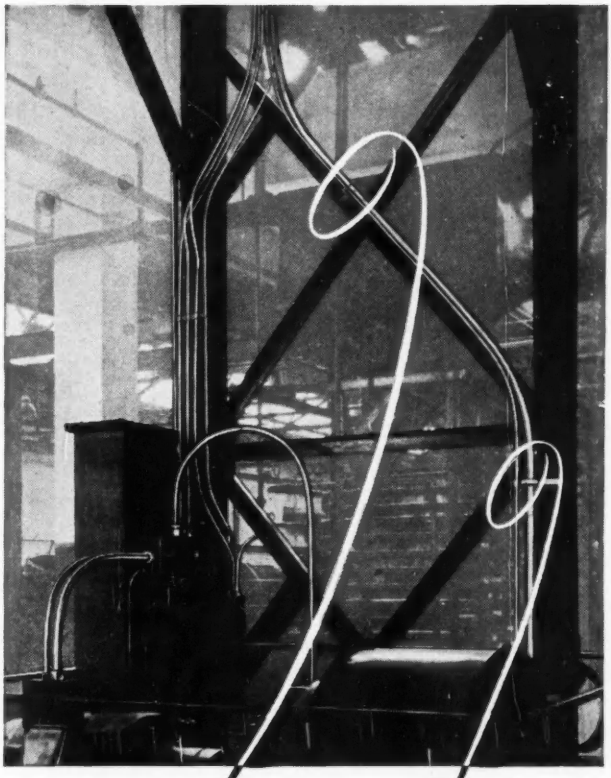

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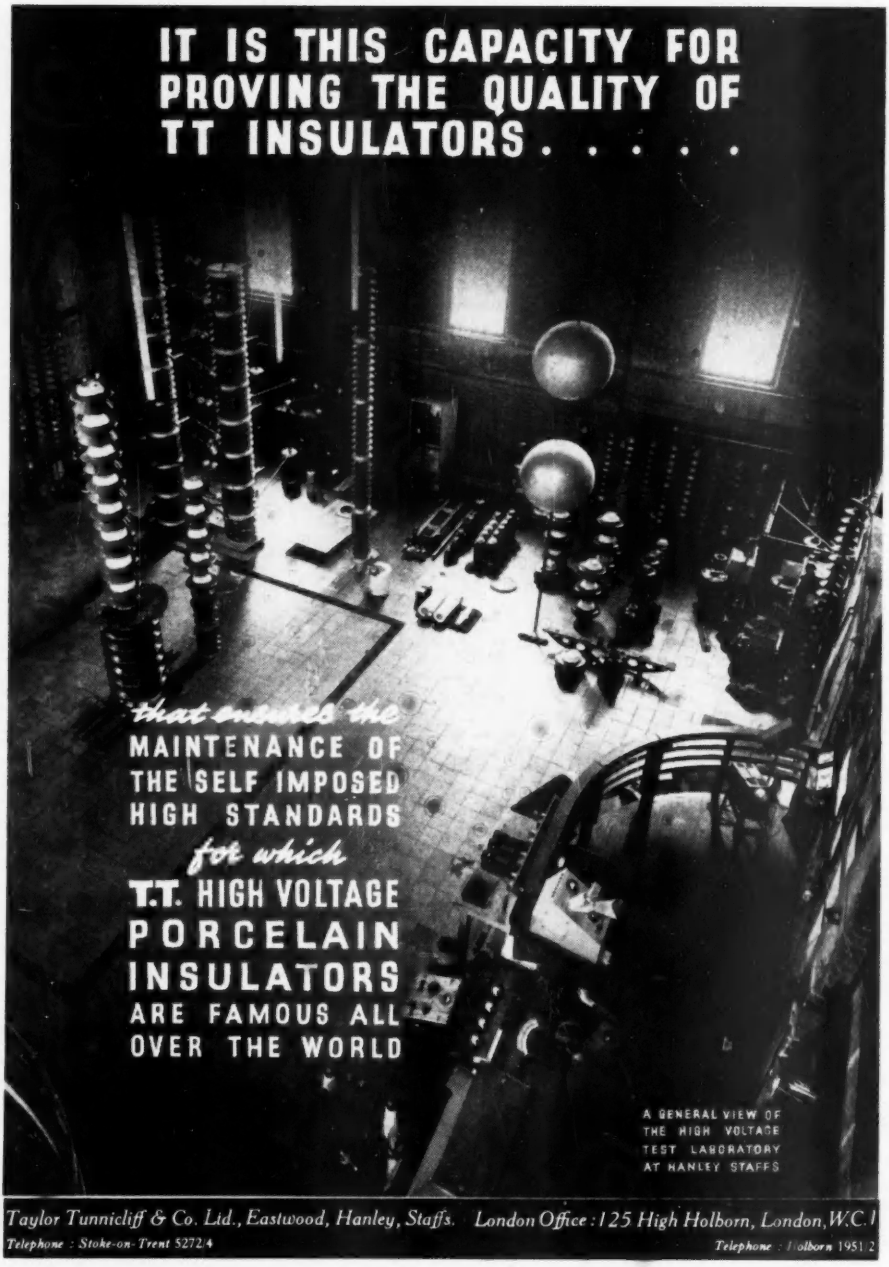
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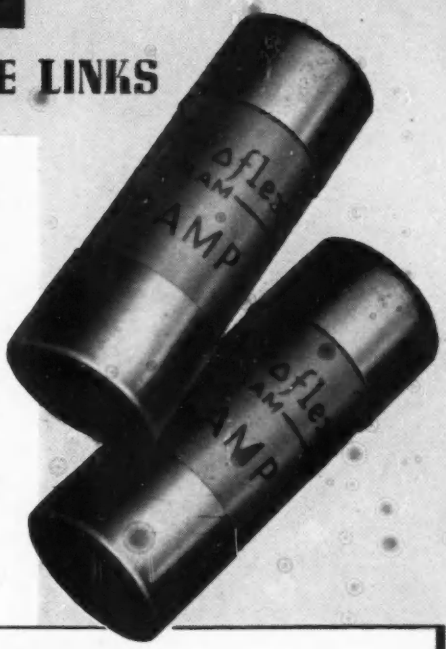

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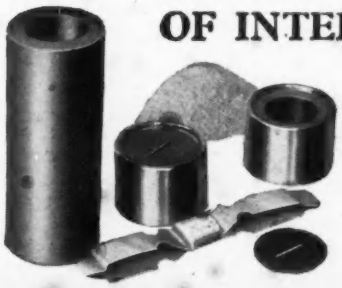

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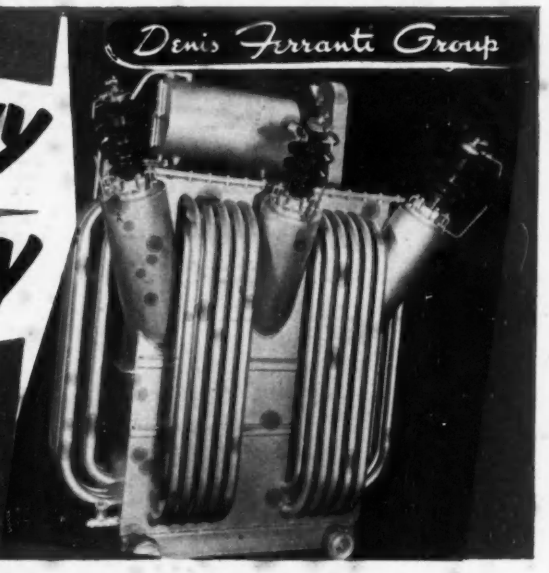

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